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RURAL WATER SUPPLY

ELECTRICAL REVIEW

FOUNDED 1872

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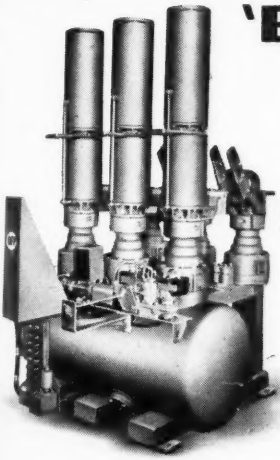

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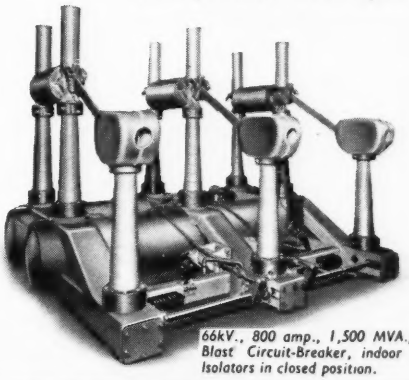

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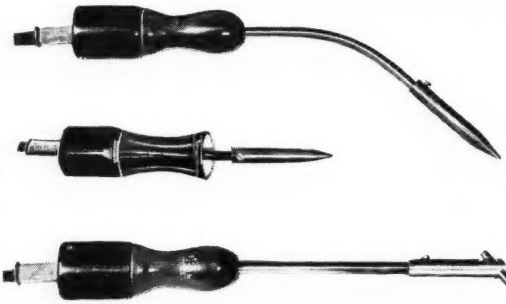

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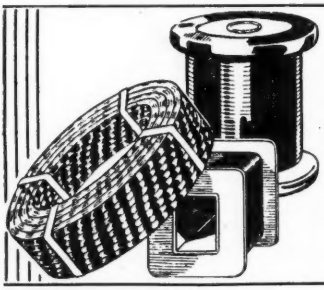

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ELECTRICAL REVIEW

August 6, 1943

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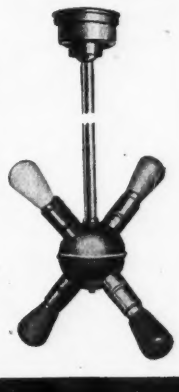

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIII. No. 3428. AUGUST 6, 1943 6d. WEEKLY

The Industry's Future

Immense Volume of Work in Prospect

RECENT discussions and reports on the construction and equipment of post-war homes (largely by women's organisations) have shown a strong desire for much better arrangements to secure the utmost benefit from electrical service. Much attention has been devoted to the improvement of the quality, and standards for electrical installations have occasionally been advocated which, however desirable, could only be reached by an expenditure which house builders would be reluctant to incur. Both architects and builders require educating, or convincing, particular stress being laid on the fact that the provision for, and installation of, a good electrical service need not be so expensive as they may fear.

Millions of Houses

But whatever views may be held regarding quality, there can be no dispute regarding the quantity of work which awaits execution until the end of the war. For nearly four years there has been little or no provision of new houses. From 1935 to 1939 the annual number of houses built in Great Britain was between 350,000 and 370,000. The enormous amount of air-raid destruction in many of our densely-populated areas has accentuated the scarcity and it is safe to assume that between two and three million houses (some say four million) will be needed. The London County Council alone has plans for building 200,000 immediately it becomes possible.

There will be extremely few new houses which will not have electricity for lighting, at least. The smallest house cannot be wired for lighting at less than £4 or £5 and in the future home there must be more than this; provision must be made for the eventual adoption of other applications. In these circumstances there will probably be anything from £7 to £10 worth of wiring work in each house and the electrical contracting industry should have enough work to keep it busy for a very long period.

New Apparatus and Arrears

The wiring, however, is only the beginning. Millions of lamps will be needed and on top of this hundreds of thousands of irons, kettles, vacuum cleaners, cookers, fires, water heaters and other electrical appliances will have to be provided for these new dwellings, apart from the immense arrears which will have to be made good in the equipment of existing houses. These are needs, not luxuries, although luxuries may be added when conditions permit.

Behind all this apparatus will be the plant and equipment for generating and distributing the energy. We have been authoritatively assured that so far from there being a surplus of this plant after the war, as was the case after 1914-1918, it is doubtful whether there will be enough to meet the needs. It may be expected that the stringency in the supply of materials will continue for some time, but the electrical industry should be able to demand a degree of priority in alloca-

tion. Surely, then, it is not being over-optimistic to consider that the prospects of all branches of the industry are very favourable. It should be possible to re-absorb all those men who have been released for the Forces and still give work to the greater proportion of the people temporarily engaged during the war who wish to carry on afterwards.

E.P.E.A. and Reorganisation

THE staffs of electricity supply undertakings are closely concerned with any measure of reorganisation of the industry and are entitled, therefore, to express their views on the subject. The Electrical Power Engineers' Association has a sub-committee considering the subject and has already received the first part of its report. From the outline which is given in the *Electrical Power Engineer*, it would seem that the sub-committee makes no new proposals but follows the commonly-held view that there should be some form of regional operation with a supreme controlling body which would own and operate power stations and transmission and distribution systems. The Electricity Commissioners would continue to exist, with "certain, but not unlimited powers."

Sweden Looks Forward

NEUTRALS in this war are faring little better than combatants and afterwards they will have to meet similar problems to ours. Sweden, for instance, one of our competitors in the electrical markets of the world, has lost many of its overseas customers. To recover them it aims, as we do, at putting better products than ever on the market. The *Anglo-Swedish Review* says that international collaboration in the technical domain has been interrupted, but Swedish scientists and technicians have worked for themselves and their keen efforts have already yielded many valuable results. British efforts have had to be devoted to the furthering of the war but no doubt a great deal of the experience gained will have its peacetime applications.

Combined Action

Our contemporary goes on to say that the question of organisation is already being discussed and many voices have been heard in favour of an organised joint appearance on the world markets of enterprises in the same field. The suggestion is one which was put forward long ago in this country: after-war conditions may compel British manufacturers to pay greater attention to the matter.

Difficulties in Eire

INADEQUATE and inferior coal supplies made electricity generation in Eire very difficult last year and improved water conditions during the winter failed to redress the balance. Severe restrictions were placed on consumers and the result was a decline of 29 million kWh, or 8·2 per cent., in the sales of energy. An increase in revenue was due to the emergency addition of 10 per cent. to prices which was made towards the end of 1941. The cost of generation per kWh rose by just over 11 per cent. and the price paid by consumers slightly less. Restrictions on the sale of appliances reduced the turnover in this department by £45,862 (the reduction was £80,555 in 1941-42). Completion of the Liffey scheme awaits the delivery of parts of the equipment.

Competitors

IN cities in the United States where there is common ownership of the gas and electricity undertakings the promotion of electricity for cooking and water heating (says the *Electrical World*) "has not been overly aggressive." That journal asks: "Is it smart business to soft-pedal electric cooking and water heating in gas areas? If electricity in the post-war era were promoted competitively with gas in these areas the companies might be surprised to see how rapidly such an electric load could be built. That might be tough on the gas department, but that isn't important in the long run. What is important is to serve the customer with what is up to date—what is wanted."

Oven Lighting

A CONTRIBUTOR to the *Gas Times* asks:—"Who with any experience of electric fittings used in damp atmospheres, especially where sulphur products may be present, would ask for an electric light *inside* an oven? What dangers one could foresee the user exposed to!" The answer is, of course, that "electric fittings" capable of withstanding even the fumes of gas cooking can be (and are) produced and are quite safe. But if electric lighting is desired, why install it in a *gas* cooker?

Rural Water Supply

Meeting the Needs of Farmers

THE main object of a scheme recently completed by an important water supply authority with a large rural area under its jurisdiction is to advance progressively and as far as possible the service to agriculture. The system as a whole embraces a number of pumping stations and reservoirs,

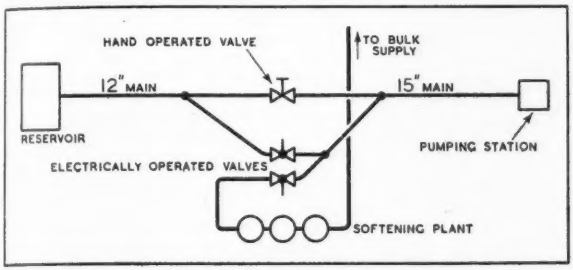
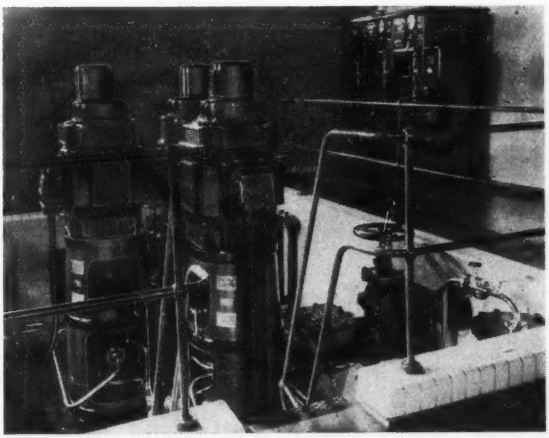


Diagram of water supply system

but we are here concerned with only one of each, a new pumping station with a maintainable yield of 1,250,000 gallons per day, and a 500,000-gallon reservoir which it serves. To a similar end a bulk supply is afforded to another company from a point between the new pumping station and the reservoir where there are suitable arrangements for passing the water direct into the receiving company's mains *via* softening plant. Reference to the accompanying diagram will help to clarify the descriptive notes.

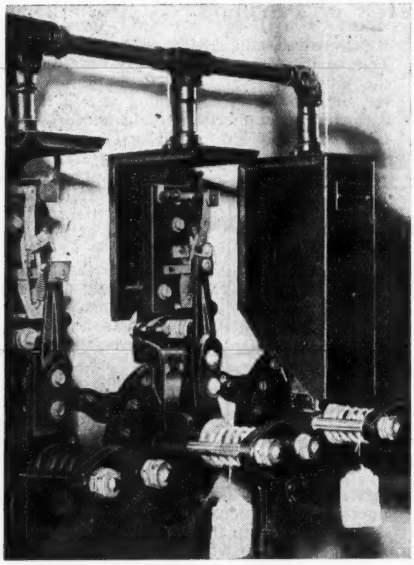
The source of water at the pumping-station site is a well about 150 ft. deep, and 7 ft. in internal diameter at the bottom. Water in the surrounding chalk soil follows fairly well defined channels, and an adit running horizontally from the bottom of the well cuts the fissures, with the result that the water drains into the well and the bore hole. The adit is 110 ft. deep, 6 ft. 6 in. high, 4 ft. wide and 397 ft. long. For lifting the water from the well there are three Harland vertical 39-HP slip-ring motor driven pumps, each of which will handle 35,000 gallons per hour. Two of these sets are normally running and the third is a stand-by. Each pump is of the submersible type, running at 970 RPM, with a solid connection to the motor shaft, the shaft extension being served by special thrust bearings. The motors are started up by contactors governing rotor resistances, and the actual starting is initiated at the contactor gear cabinet. The shaft bearings are water cooled, and if the pressure falls so low as to render the cooling ineffective the pump motors are automatically shut down by pressure switches—one for each motor. These Igranic pressure switches operate on the diaphragm principle, pressure on either side of the diaphragm operating a contactor in the motor circuit.

The water from the main pumps passes to a surface tank in which there are a series of baffle walls for aerating purposes and chlorine is injected into the water. The tank accommodates about 51,000 gallons of water and "holds" it for rather less than an hour at



For lifting the water from the well there are three vertical 39-HP slip-ring motor driven pumps; starting is initiated at the contactor cabinets (rear right)

full speed. The chlorine injection is effected by a small motor-driven equipment which is automatically controlled by direct electrical connection with the main pump-motor contactor.

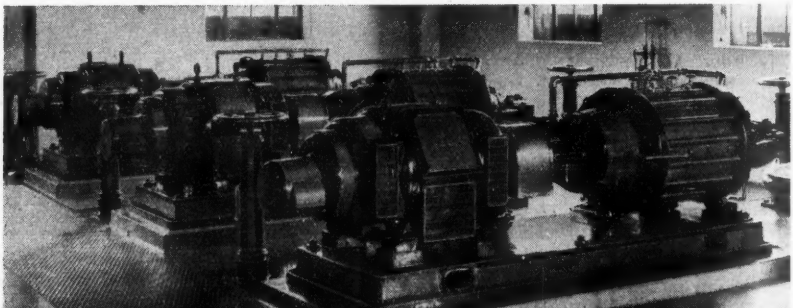


If the water pressure falls so low as to render the cooling of the well-pumps shaft bearings ineffective, the pump motors are automatically shut down by pressure switches

Horizontal booster pumps pass the water on from the chlorinating tank to the reservoir some miles away. Each booster pump has a capacity of 35,000 gallons per hour and is directly coupled to a 50-HP, 965-RPM slip-ring motor with control arrangements similar to those for the well pumps, except that there is no pressure control in these cases. The water is treated on the "super-chlorinating" system, *i.e.*, more chlorine is injected than is required and is later neutralised. Thus there is a scheme similar to that for injecting chlorine for injecting the neutralising agent (sulphur dioxide) into the system just before the water reaches the booster pumps. The motor in this case is controlled similarly from the main contactor of the booster-pump motor.

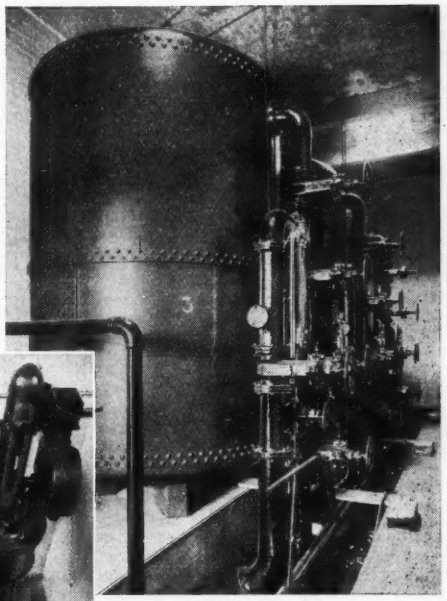
At the reservoir there is a float-operated transmitter which is connected by Post Office lines to a recording instrument on a main control board at the pumping station, so that information about the depth of water at the reservoir is always available. The transmission is effected electrically and there is a similar recorder operated from the same transmitter at the reservoir site. In conjunction with this scheme, a bell alarm is also operated remotely and automatically. The depth of water below the floor level at the pumping station and the main water flow are also recorded electrically on the main control board at the pumping station, and this board also accommodates the equipment for a similar scheme in connection with another reservoir on the system. The capacity of the reservoir is 200,000 gallons, with a 10 ft. depth of water, and the top water level is 610 ft. above sea level.

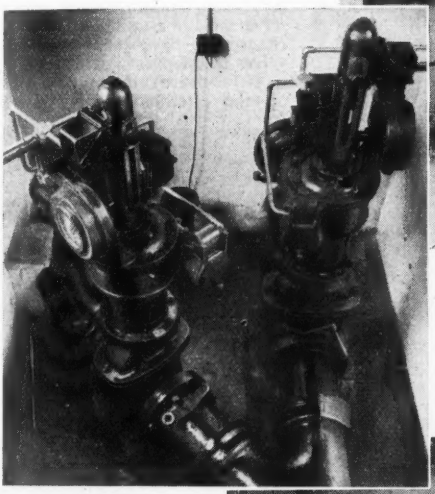
At the point on the water main between the pumping station and the reservoir where the bulk supply is taken there are two electrically operated valves so arranged in the branch and by-pass connections as to control the direction of flow of the water either to the reservoir or the bulk supply.

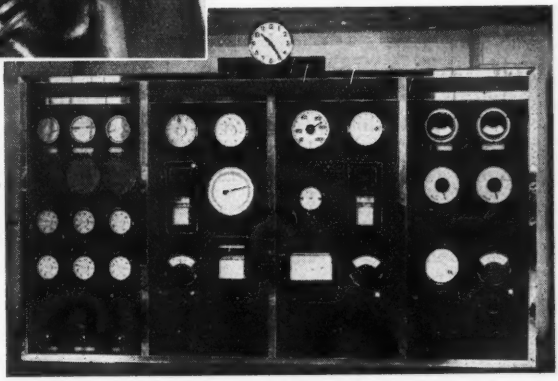


Horizontal motor-driven booster pumps pass the water on from the chlorinating tank to the reservoir

These valves are remotely controlled from the pumping station. For this purpose there are on the control board at the pumping station two instruments, one for each valve, with settings up to ten inches, representing valve openings. Each valve is started up remotely by means of a separate switch on the control board, which operates a suitable contactor in the valve house, and then the desired setting is made on the valve-setting indicator. The setting affords a time control of the running of the valve motor, according to the time required to open the valve to the point corresponding with the instrument setting. The motor is automatically shut down at the end of the period dictated by the instrument setting.







Above : Each tank of the bulk-supply water-softening plant will pass 100,000 gallons between regenerations
Left : The electrically operated valves are normally remotely controlled from the pumping station ; valves can be controlled in the valve house
Below : Remote recording and operation is effected at a central control board at the pumping station

On a visual confirming indicator the opening of the valve is represented by the swing of a needle and for closing the valve the whole sequence of operations is repeated, in the reverse direction.

The valves can also be operated by local remote control by means of suitable push-buttons on the motor contactors in the valve house, and they can also be hand operated by means of a suitable handle which engages with the end of a worm shaft enclosed in a container fitted with a door which is electrically interlocked with the motor circuit, so that the motor cannot be run while the door is open.

The water softening plant for the bulk-

supply scheme includes three 1,700-gallon softening tanks which can be put into operation as required by hand valves. Each tank will pass 100,000 gallons of water between regenerations. Water from the tanks at zero hardness is blended by mixing it with hard water to bring the hardness up to the desirable index of seven. The softening tanks are served with brine on the base exchange method, there being two tanks, one for recovered brine and one for new brine.

The softening tanks are regenerated from brine tanks equipped with two motor-driven pumps

On starting regeneration, recovered brine is pumped into the unit. New brine which is next pumped in displaces the recovered brine which is drained away. The new brine is pumped in to the capacity of the softening tanks and is then pushed back into the recovered brine tank by letting hard water into the softening tanks. The softening plant is next washed out to remove traces of salt and is then ready for service. Two manually controlled motor-driven pumps serve the brine tanks and are interchangeable by means of suitable valves in the pipe system.

At a nearby distribution pillar on the electricity supply system from which this water-softening station is served Switchgear & Equipment interchangeable fuse units are employed. Each unit takes a h.r.c. cartridge fuse which is centrally disposed in the bridge of the unit, but it can be rewired as an " open " fuse unit by the use of side channels in the bridge.

Watertight Switch Box

A ROBUST new " CB " 5-A one-way switch box (CPB 7) produced by Callender's Cable & Construction Co., Ltd., Electra House, Victoria Embankment, E.C.4, has been designed generally for use with the company's moisture- and corrosion-proof wiring system and is similar in style and appearance to that system's existing fittings (CPB 1 to 4 inclusive). It is made of high-grade brown bakelite with an internal porcelain switch block. Definitely watertight, fume-proof and corrosion-proof construction, with ability to operate efficiently under very severe conditions, is claimed. The appearance is neat and wiring connections are extremely simple.

The switch is operated by a specially designed knob which has a semi-rotary quick-make-and-break positive action. A flexible rubber washer, with internal grooves, prevents moisture or fumes penetrating the cable entry of the box, and non-corrodible screws are employed to fasten the cover.

Though designed for 1/·044 in. or 3/·029 in. twin flat t.r.s. cable, the unit is equally suitable for other types of twin flat (including metal sheathed) cables of approximately similar dimensions, and it can also be used with screwed conduit up to ¾ in. diameter.

Under test the box, fitted with 3/·029 in. twin flat t.r.s. cable, was completely immersed in water for 24 hours, then tested with a pressure of 600 V ; the insulation resistance between conductors, and also between conductors and water, was found to be infinity. The complete assembled box and cable were also placed in a large desiccator filled with moist chlorine gas and left in that atmosphere for 48 hours. Afterwards the interior of the box was examined and found to be dry and entirely unaffected. The metal parts of the switch (brass and copper) were also completely unaffected, indicating that the chlorine had not penetrated to the interior of the switch box.

Callender's " CB " watertight, fume-proof and corrosion-proof switch box, showing (right) internal porcelain switch block

"Rythmatic" Control

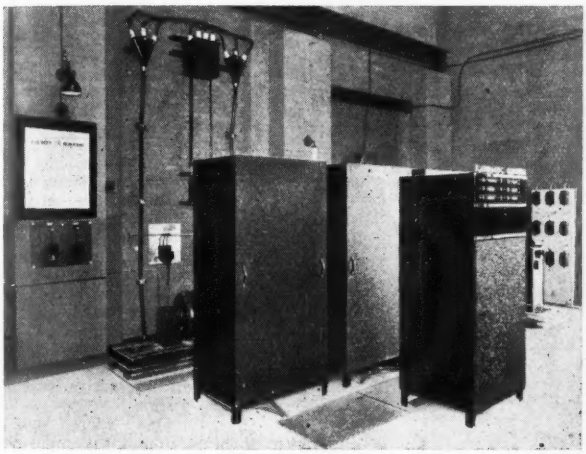
Service Experience and Operating Results

By S. A. Daines, A.M.I.E.E.

Mr. S. A. Daines, Meter and Testing Superintendent

AUDIO-FREQUENCY current, rhythmatically interrupted, has been superimposed on a complete electricity distribution system at the centre of the network by way of the high-voltage busbars in the generating station, for signalling and distant switching.

For the particular installation under review frequencies of 1,500 and 800 c/s are utilised together with rhythms of 0·44, 0·54, 0·66, 0·8 and 1 second per beat. The distribution system is typical, with 11-, 6·6- and 2-kV transformers stepping down to 400/230 V as well as 210/105 V, covering an area totalling 200 square miles, which is both urban and rural with every conceivable kind of load.



Main transmitting equipment in central power station

Switching relays function as receivers, being connected to the distribution mains wherever most convenient. They operate on the principle of dual selection, each having incorporated in it an electrical filter for frequency response and a mechanical filter (swinging armature, spring controlled) for rhythm response.

Transmitting Equipment

The main transmitting equipment, made by the Automatic Telephone & Electric Co., Ltd., together with the two 10-kW generators, is push-button operated in association with indication lamps. Thus the depression of any one of eight buttons will initiate the transmission of the signal associated with that button. To date, the signals in operation are street lighting "on," street lighting "off" midnight, street lighting "off" dawn, Home Guard, "purple warning," air raid warning, "raiders passed" and wardens' call. Of these signals, the three street lighting ones are entirely automatic, being controlled by solar-dial time switches and the five others are remotely controlled for convenience.

Like all sensitive electrical apparatus, this equipment has on occasion developed "teething" faults, but in nearly every case the trouble has been of an elementary nature, such as a sticky push-button, dirty relay contact, faulty neon indication lamp and so on. Experience has taught that push-buttons should be periodically cleaned and slightly oiled in their housings, small type contacts cleaned by air blowers, and neon lamps never used in a circuit where the lowering of resistance between poles is likely to by-pass enough current to operate, or to short circuit, a sensitive relay.

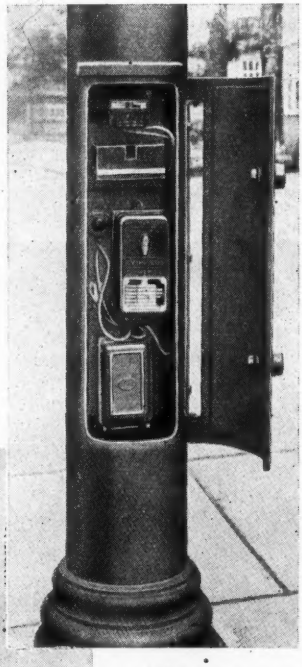
The main contactors, which intermittently break the control current, were originally oil immersed, the oil being changed once a month, but excessive wear after three years, or approximately 10,000 operations, necessitated their being changed and air-break contactors are now being given a trial.

Receiving Apparatus

At the outset when the main function of the equipment was control of public lighting, the installation and maintenance of the appar-

atus was designated to the Public Lighting Department, but it soon came to be realised that the galvanometer type of control switch, or relay, was more within the province of the Meter Testing Department. The change-over of responsibility has proved itself by resulting in a remarkable decrease in the number of faulty relays. In the main, faults were found to be caused by the pivots and bearings of the swinging armature being damaged by rough usage, or incorrect adjustment by inexperienced labour. The time involved in a systematic check-over of 1,100 installed relays has now been reduced to such an extent that one meter mechanician carries out the work as a part-time job only.

In the matter of siren operation the ideals of synchronism and speed are attained, much to the satisfaction of the discriminating public. Reliability for this application has latterly proved very satisfactory, but initially some trouble was caused through one particular type of siren control unit not being matched to respond quickly enough to the contacts passed on by the "Rythmatic" relay. After experiment, this difficulty was overcome by the simple remedy of changing an 8,000 ohm resistance to a 4,000 ohm resistance in the siren controller. One relay that responds to the " siren signal " is in a circuit which automatically and satisfactorily energises an unlocking device on an air raid shelter door. In an area where shelter fittings are continually being stolen and damaged, this seems to be a satisfactory solution so long as a warden is available for locking the door after a raid.



Switching relay in street lamp standard and (left) portable alarm for A.R.P. wardens and Home Guard

Wardens and Home Guard key men are issued with a portable alarm unit, consisting of a relay and mains-operated bell housed in a small attaché case, with a length of flexible lead for connection to a convenient socket outlet, wherever they may be.

Of special note is the " purple " signal which serves several large outdoor working concerns, where outside lighting must be switched off immediately an air raid is imminent. By connecting the relay to a contactor-operated circuit controlling the external lighting, the lamps are switched off at once. The field of use for this type of application is very wide and goes a long way to answer the appeal for instantaneously blacking out well lighted streets, shipbuilding yards, docks, etc., thereby lessening accidents and increasing production.

Incidentally, at one of these large works the signal strength recorded on a circuit containing large power factor correction condensers was very weak, but the difficulty was overcome by transferring the relay to an alternative supply main.

One "spare" signal is being put to novel use in that it is employed to call out a mains engineer who lives outside the borough and who is unable to get a telephone installed. When he is on stand-by duty at week-ends and is required to report at headquarters to attend to a fault, the engineer-in-charge merely presses a button and in ten minutes the mains engineer reports.

Mal-operation of relays due to parasitic frequencies and transient voltages is more of a nightmare than a fact, especially where siren circuits are concerned; on about six occasions over a period of three years hurried investigations have been necessary to ascertain the cause of an isolated siren sounding for no apparent reason. Except for two cases, the true cause has been traced to the human

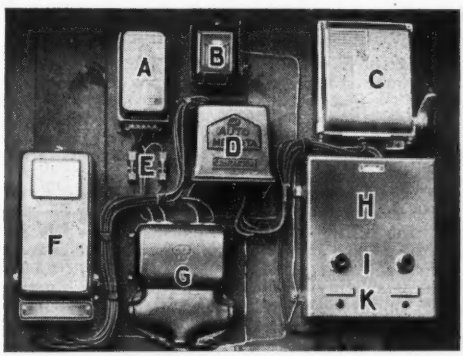
element in the form of a warden, policeman, or fireman accidentally pressing the emergency buttons installed adjacent to the relay. This bogey has been killed by fitting protective covers over all emergency buttons.

One known case in which external surges caused relays to operate was when a length of cable had developed a serious fault, was burning out and was causing neighbouring lighting to flicker very violently. Within 30 yd. of the fault, relays for operating indication lamps only were installed and by a coincidental combination of fault conditions the relays were set working so rapidly that the indicator lamps showed "air-raid warning" and "raiders passed" signals at the rate of approximately one every two minutes. Fortunately such faults, which are uncontrollable, are rare.

Post-war Applications

While public lighting control will continue and extend, another service can be rendered by the automatic switching off of shop window lighting at specific hours after normal closing time.

The control of restricted-hour and water-heating loads opens up a large scope for the application of this type of apparatus, with the especial advantage that the control engineer at the power station can switch the unwanted load off at times varying from day to day according to the movement of his peak load periods. With time switch control at the load end, the control engineer has virtually no means of ensuring that loads are switched off at the correct times. With such flexibility of control any electricity undertaking can substantially reduce its peak load and hence its financial outgoings for the purchase of energy from the C.E.B.



Equipment for A.R.P. siren in rural area, 15 miles from central control station

A, "Rythmatic" relay; B, heater main switch; C, siren motor main switch; D, contactor (three-phase); E, fuses; F, three-phase meter; G, three-phase service cutouts; H, siren time controller; I, indicator lamps; K, emergency buttons

Acknowledgment is made to the chief engineer and general manager of the electricity undertaking concerned for permission to publish this information.

Radio Industry Expansion

ADDRESSING the Radio Industries Club in London last week, Mr. G. M. Garro-Jones, Parliamentary Secretary to the Ministry of Production, said that on the whole the post-war outlook for the radio industry was more assured and clear than that facing many other wartime industries. It was bound to be a much larger industry than before the war. Nevertheless, they would be unwise to think that the whole of the present enormously expanded radio industry (comprising many hundreds of firms compared with about 80 specialist firms before the war) could be absorbed in the production of peace-time devices.

Among equipment which would have important post-war applications he named radio-location, or "radar" as it was now called, but added a warning that the general introduction of these devices, many of which must be altered, would depend upon international collaboration and would take time. There were many outlets, however, such as radio receivers, to replace obsolete types, and television, which need not await the solution of international problems.

Earlier in his talk Mr. Garro-Jones dealt with research and development, saying that radio offered many examples of successful co-operation and interplay between the university, the independent amateur and the industrial laboratory, and in the future there would come great contributions from these three sources. But the very common general interest of all users in the results, the need for far-reaching experimental facilities and for close co-operation among workers, as well as the wide geographical spread of the areas over which observations and measurements had to be carried out, made it very essential for the State to extend a helping hand.

Many people claimed that the State should control all research and others that it should take its hands off altogether, but the development of the radio industry was a conclusive refutation of both of them. To-day the radio laboratories which worked for the three great Supply Ministries contained the cream of the country's younger physicists. The country was greatly in their debt, but the universities which had temporarily lost them would be direct beneficiaries in the end.

On wartime production, he said that one of the major development trends was likely to lie in reduction in size, although he did not suggest that radio was going "miniature."

Electrical Power Engineers

Proposals for Supply Reorganisation

AT a recent special meeting the National Executive Council of the Electrical Power Engineers' Association considered the first part of a report prepared by the Association's Post-War Planning Sub-Committee. It was introduced by Mr. G. O. James, chairman of the Sub-Committee, who (according to the *Electrical Power Engineer*) pointed out the detraction from full efficiency in the electricity supply industry resulting from the existing divided responsibility for control. There should be one supreme controlling body only, but it would be necessary to have subdivision into operative regions which, however, should not be so extensive as to be unwieldy. Regional consultative committees should be set up to co-operate with regional managers, with some arrangement for inter-regional contact. The Electricity Commission should be retained with certain, but not unlimited, powers.

Fresh legislation would be necessary in order to what the speaker called " tidy up " the Electricity Supply Acts. Training for entrants into the industry should be properly organised. In short, thorough reorganisation, from top to bottom, was urgently desirable, and practical proposals for the attainment of that object were set out in the report. The industry, Mr. James said, had grown freely in its early days, and that was all to the good, but now the time had arrived to set it in proper order. He called particular attention to the words of Sir William Jowitt, that " no vested interest and no politics, local or national, should prevent supplies being organised on the most efficient basis possible."

Mr. Telford said that at present the industry was a monopoly operated partly for private gain and such a situation could not be defended as a permanent arrangement. They did not want it converted into a State department, however. The proposed National Board must be a national body, but not directly under the State. It should have upon it labour representation, consisting not only of staff men but of workers as well.

Later in the account of the meeting it is said that the broad leading principle recommended in the report is the assumption of control of the entire electricity supply industry by a single public authority having wide powers but not coming directly under the State. This body would acquire all the statutory undertakings and be responsible for a national policy in respect of generation, transmission, distribution and utilisation of electricity.

By this means, it claimed, " very many of the complexities, anomalies, and even absurdities, which hitherto in an ever-growing degree have tended to retard progress and stultify the provision of maximum benefit to the community at large in connection with this vital public service, would be swept away, or at least their speedy removal would be facilitated."

Extension of Schedule

At present the salary schedule of the National Joint Board provides for station capacities in twelve classes—from A (1,000—2,000 kW) to M (250,000 kW and over). It is now felt that the time has arrived to attend to the upper end of the scale. When Class M was instituted in 1935 no undertaking member of the Joint Board had a station with a capacity exceeding 250,000 kW and there were few undertakings whose total capacity was over that figure. Now there are two stations with capacities exceeding 500,000 kW and several undertakings whose total capacity substantially exceeds 250,000 kW.

Employees of these undertakings consider that they are entitled to an increase in salary for which the schedule at present makes no provision and it is proposed that the schedule should be extended to 500,000 kW and over. The position is accentuated by the fact that there is no provision for incremental advances for service in Class M as there is in the lower classes.

The employers have suggested that the small number of undertakings affected hardly justifies an alteration to the schedule and that staffs in those larger undertakings are already being paid more than they would get under an extension of the schedule. The E.P.E.A., however, questions the validity of these arguments.

South Coast Sufferers

The National Executive Council recently considered a plaint from members in South Coast undertakings. It had been pointed out that on account of evacuations the output of some of these undertakings had been substantially reduced with the result that the stations had been placed in a lower class and their engineers had suffered reductions in salary.

In a letter to the *Electrical Power Engineer* the hon. secretary of the South Coast Section of the E.P.E.A. (Mr. L. J. Simmons) raises another point which makes the position of these engineers even more unsatisfactory. It is that by the operation of the Essential Work Order they are prevented from accepting the more responsible and remunerative posts in other undertakings which are offered to them.

Oil Maintenance

Some of the Less Familiar Aspects

By C. H. Pike, Grad.I.E.E.

This subject was introduced by the author in the* Electrical Review *of July 9th (p. 51). In the present article he studies the effects of oxidation, acidity and carbonisation upon the quality of insulating oil and refers to testing methods

INVESTIGATIONS and experience during recentyears have shown that highly refined oils (Grade A) are not outstandingly resistant to oxidation. They differ essentially from "normally" refined oils (Grade B) in the type of products resulting from oxidation. Refining removes the more chemically active hydrocarbons from crude distillates, but it also removes to some extent the small quantities of those oxygen- and nitrogen-containing compounds which may make the oil more resistant to deterioration. Under-refining effects incomplete removal of constituents which produce chemical instability.

The susceptibility of oil to oxidation is not significantly reduced by intensive refining. Oxidation seems to proceed more slowly at the outset, but eventually the rate increases and exceeds that common to Grade B oils. The oxidation products of Grade A oils generally include a greater proportion of non-solid or oil-soluble products than do normally refined oils, so that although Grade A oil may sludge at a lesser rate than Grade B, the rate of acidity development will, in general, be greater. In conservator-type transformers and with indoor units with breathers, little trouble is experienced with Grade A oil. On the other hand, excessive acidity has occurred when using Grade B oil in indoor-type transformers without breathers, but experience suggests that for units with comparatively large areas of oil Grade B is preferable.

Acidity Development

Oils exposed to atmosphere and maintained at 90 deg. and 115 deg. C. for long periods have shown the superiority of Grade B in respect of developed acidity. Although a proportion of such acidity is volatile and therefore escapes during experiments made in vessels open to atmosphere, whereas the acidity of Grade A oils is largely non-volatile, the values obtained are, after allowing for this factor, still significantly in favour of Grade B oils. Experiments with oils in closed containers (Bib. 6), in which coils connected to an AC supply were maintained at a temperature of 85 to 90 deg. C. for a period of six months, also showed that Grade B oils developed less acidity than Grade A oils although the bulk of any volatile acid was retained.

Laboratory tests are not necessarily a reliable guide to service conditions, and some of these indicate rates of acidity development far too high to satisfy practical requirements. Experimental results are, however, confirmed by practical experience. In any case only "Pool oil" (equivalent to Grade B) is now available and expert opinion does not favour the re-introduction of Grade A oils as specified in B.S.S. 148.

The use of Grade B oil does not necessarily prevent acidity troubles. Apart from the effect of high temperatures, high rates of cooling with decreasing load, inadequate breathing or absence of conservator and/or properly maintained breathers, excessive acidity may develop as the result of hot spots or by the action of oil on gaskets, packing, internal painting or certain insulating varnishes. Hot spots in modern transformers will probably be due to the clogging of oil ducts or cooling systems by previous sludging. When oil is changed, the transformer should be thoroughly cleaned internally, otherwise serious deterioration of the new oil may occur due to acidic products of the old oil remaining in the windings or oil ducts. Residual acid can be removed by washing with high-pressure water, after which the windings are vacuum-dried. The only cure for hard sludge in the ducts may be rewinding.

Grade B oil has for some time been used in oil circuit-breakers, since the temperatures and temperature variations, and hence the rate of oxidation and sludge formation, are usually low. Moreover, oil is usually scrapped after a breaker has interrupted abnormally heavy currents, since the dissipation of arc energy in it causes cracking. Serious acidity in switch oil is rare, but it may be caused by over-heating of contacts due to bad adjustment or heavy loads or by electrical discharges.

Carbonisation in Oil Circuit-breakers

Carbonisation, which occurs whenever an arc is struck, is the most serious form of contamination in oil circuit-breakers. The most severe carbonisation occurs in arc-furnace breakers. Even repeated interruption of magnetising-current may in time produce serious contamination. As the oil temperature decreases the rate of carbonisation increases due to increasing viscosity, and the carbon is not so readily dispersed through the oil. Oil of greater viscosity than Grades A and B, which is used for busbar and current-

transformer chambers and sometimes for oil-immersed isolators, has a very high electric strength and does not appear to deteriorate appreciably if dirt and moisture are excluded, but it is more difficult to purify.

The suitability of insulating oils as filling media in transformers and switchgear is determined by physical tests—viscosity, flash point, cold test, evaporation (or volatility) and electric strength—and chemical tests—acidity, saponification value, copper discoloration and sludge and oxidation. The quality of oil in service is generally determined by tests of electric strength, and flash point. The electric-strength test detects contamination caused by water, dirt, fibres, etc., but does not, in general, give a definite indication of either water or foreign matter—a combination of both is required.

Moisture and Deterioration

In practice, perfectly dry oil is not obtainable and traces of moisture, however small, are always present, together with a minute quantity of fibres. Since water by itself may not be detected by an electric-strength test, this should be supplemented by the crackle test. Electric-strength tests chiefly indicate the condition of oil and are not a guide to chemical deterioration. The development of acidity, which indicates the progress of chemical deterioration, does not appear to have a marked effect on electric strength, unless fibres or particles capable of absorbing liquid oxidation products are present.

Relationships between developed acidity and electric strength of a clean oil subjected to oxidation tests are shown in the table (see Bib.11). During the initial stages of deterioration the electric strength of the oil increased by approximately 5 per cent. ; later, only a moderate decrease towards the initial value was observed over a considerable range of oxidation. The increase in electric strength was considered to be due to oxidation, to cleaning up of residual impurities or to the break-up of large unstable molecules into smaller and more stable molecules. The subsequent decrease was attributed to increased conductivity.

Electric strength generally increases with temperature from about −5 to 100 deg. C., after which it remains constant over a range and eventually decreases. Below −5 deg. C. the electric strength increases quite rapidly, probably because the moisture particles in suspension are frozen.

Acidity is best determined by the chemical tests stipulated in B.S.S. 148. Although acid values may not have equal significance, since the proportion of volatile acid retained and the quantities of other active oxidation products depend on the particular oil and service conditions, such values are, in general, a useful criterion of quality. The precise amount of acidity which can be tolerated safely is difficult to determine because the value obtained may not include all the volatile acidity or allow for the greater activity of some forms of acid. Acidity tests do not, therefore, give any direct information as to the possible effect of the acid on solid insulation or its corrosive action on metals. Generally, acidities of from 0·2 to 0·3 mg. of KOH per gm. can be ignored unless these values are reached after a very short period of service. Values of the order of 0·5 to 0·75 demand careful observation at more frequent intervals and arrest of acidity if possible by attention to operating conditions. Values of 1·0 indicate that the useful life of the oil is likely to be short, since the rate of increase of acidity often accelerates considerably thereafter.

Rate of increase of acidity is more important than numerical value. When the increase is slow and regular over a period of years and then suddenly accelerates, the cause of the change must be ascertained. Values of from 6·0 to 7·0 have been recorded without any resultant electrical faults or failure, but deterioration to this extent should be avoided, as transformer windings, etc., become difficult to clean thoroughly and traces of acid oil left in in them are detrimental to the life of the new oil. High values of acidity may also produce a considerable reduction in the insulation resistance of transformer windings.

Power Factor and Conductivity

Deterioration increases the power factor and conductivity of oil. Oxidation tests showed excellent correlation of acidity and saponification with power factor and conductivity (see table). Low dielectric loss is almost invariably associated with high resistivity, the relationship varying for different oils. Increase of power factor with deterioration arises from many of the products of oxidation, *e.g.*, the acids, alcohols and water having polar molecules. In an alternating field the polar molecules will be re-oriented every half-cycle ; energy is therefore absorbed and heat developed so that electrical loss and increased power factor result. Since molecular friction depends on viscosity, which decreases with increasing temperature, the power factor increases with temperature due to the diminishing resistance to motion of the molecules.

OXIDATION TESTS OF A HIGHLY REFINED OIL AT 40 DEG. C.

Acid No.	Saponification No.	AC power factor	Final conductivity, mhos per cm. X 10−14	B.D.V. at room temperature
—	0·05	0·00065	0·02	27,500
0·052	0·166	0·00175	1·05	27,875
0·19	0·52	0·00500	4·54	28,900
0·36	0·90	0·00820	8·8	28,575
0·60	1·50	0·01360	15·4	28,350

There is a tendency to rely on power factor tests to detect loss of quality of oil in service (Bib. 12). New clean oil has a power factor of about 0·0002 at 20 deg. C., which increases after some years' service. A value of 0·001 at 20 deg. C is satisfactory for used oil, but if the value exceeds 0·01 the oil requires attention. Power-factor tests are difficult to carry out, the apparatus being expensive and bulky, so that generally they are not practicable for routine maintenance tests. Conductivity (or resistivity) tests are easily made; the apparatus is simple and can be designed for a DC testing voltage of from 300 to 500. The relationship of deterioration and the final or long-time DC conductivity of an insulating oil is shown in the table. The increases in conductivity as deterioration progresses provide a reliable criterion of oil quality.

An appreciable decrease in flash-point results from partial cracking, accompanied by an odour similar to that of acetylene, and the oil should be tested for flash-point immediately. Pronounced acidity is also indicated by a characteristic odour. Oils with flash-points 20 deg. C. below the B.S. value may be kept in service.

The bulk of contaminating moisture or solid matter can be removed from oil by either centrifuging or filtering or a combination of both. Neither by itself cleanses oil perfectly. Generally centrifuging is the best method when the oil contains comparatively large quantities of moisture, but when finely divided carbon is the main form of contamination and the moisture content is low, filtering is superior. Various other practical factors—such as portability, capacity and ease of operation—also determine the type of apparatus employed. A major factor may be whether the oil-filled equipment is situated indoors or outdoors. In the latter case water removal may be the main problem, but this will not generally be so with indoor equipment.

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Gold Mining Plant

CONSIDERABLE progress has been made in the installation of refrigeration plants in Witwatersrand gold mines. This form of electrical machinery has only been in use for a few years, but it has proved the most successful for use in the deepest workings. Three large mining companies have recently installed such plant, which is simplifying the sinking of shafts to depths of more than 10,000 ft. where peculiar problems of ventilation and cooling are encountered. As the plants have given good service it is possible that after the war the gold mining companies will spend considerable sums on such equipment, the principal purpose of which is to maintain all the year round a low temperature suitable for mining operations. In the busiest gold mines, workings at a depth of 8,000 ft. have been reached and with this new plant it will be possible to obtain at that level corresponding temperature conditions to those prevailing at a depth of 6,000 ft., so reducing the temperature depth.

British winding gear is used extensively in these mines, and particularly because so much attention is paid to the safety factor, irrespective of the motive power. Interest has been shown in the costly steam compound set, run in conjunction with a steam accumulator using exhaust steam from other engines. The newest types of AC winder, operating on high voltage supply from the mains, have also given good service. The winding machinery for South African mines is generally provided with brakes with which overspeed is impossible and which will not allow cages to be dumped on shaft-bottoms. There is also provision to reduce wear on the post-brakes. Much of this machinery will have to be replaced after the war.

Mysore Schemes Held Up

IN the 1941-42 report of the Mysore Electrical Department it is stated that the revised grant for capital outlay was Rs. 17,76,700, but actual outlay was only Rs. 7,46,509. This was due to the fact that some of the major capital works and town electrification projects in progress had to be stopped through lack of materials from overseas. It was not possible to complete the second circuit of the transmission line between Mysore and Bhadravati. In spite of the strain of war conditions, however, the Department's operations continued to be satisfactory and the revenue increased by Rs. 9,40,788 to Rs. 65,80,206.

Irish Output Declines

Conditions Remain "Very Difficult"

ELECTRICAL development in Eire was halted last year when the shortage of coal, which has to be imported, made it necessary for the Electricity Supply Board, in consultation with the Board of Supplies, to introduce a rationing scheme on May 19th, 1942. Thanks to an improvement in the level of the Shannon, enabling the Ardnacrusha plant to bear a greater load, rationing was temporarily relaxed on September 11th, but at the beginning of the present summer additional restrictions were again imposed.

In its report for the year ended March 31st last the Board says that the conditions under which supply was maintained continued to be very difficult throughout the year. The quality of coal, already somewhat low, deteriorated further, and quantities adequate to meet requirements could not be secured. The connection of new consumers was discontinued and restrictions were placed on consumption. In September, new connections were resumed, but only for limited lighting purposes. An inter-departmental committee was set up to advise the Board on applications for industrial supplies.

As a result of the prevailing conditions there was, for the first time in the Board's history, a decrease in the quantity of electricity generated and sold. Comparative data for the past five years are given below:—

Year	Million kWh		Consumers
	Generated	Sold	
1938-39	377·6	295·3	160,382
1939-40	407·0	318·6	172,545
1940-41	435·9	345·2	183,747
1941-42	450·4	357·3	200,419
1942-43	414·4	328·1	210,475

Of the total production, 293·7 million kWh was generated at the Ardnacrusha (Shannon) station, an increase of 53·4 million kWh over the previous year's output, while the Pigeon House steam station generated only 119·9 million kWh, a decrease of 89·5 million kWh. The maximum load on the main stations was 112,000 kW (against 119,500 kW), and the load factor on the basis of kWh generated was 42·2 (against 43·1) per cent.

In addition to the electricity generated, a small number of kWh (0·6 million) was purchased in bulk at Lifford from the Electricity Board for Northern Ireland ; it may be recalled that a scheme for linking up the two systems at this point was brought into operation last year.

An analysis of kWh sold indicates that there was a decrease in all categories except traction. Domestic consumption (million kWh) was reduced by 11·9 to 131·6; motive power by 10·2 to 118; and general lighting by 4·6 to 22·4.

Financially, the appreciable saving in expenditure on coal through the more favourable water conditions was largely offset by increases in other costs. There was, however, a reduction of £46,760 in working expenditure which (including £295,000 depreciation) totalled £1,453,659. On the other hand, revenue increased by £44,938 to £2,236,534, for which the 10 per cent. emergency addition to charges imposed in November, 1941, was responsible.

After providing for interest and other charges there was a deficit of £58,963, as compared with a deficiency of £130,303 in the previous year, and the contingencies reserve has been drawn upon to reduce the debit balance carried forward to £13,416. This reserve is now exhausted, and, owing to restrictions on supply, revenue cannot be increased on the basis of existing charges. Estimated increases in expenditure during the current year will consequently result in a much larger deficit.

Tabular information included in the report shows that the average price paid per kWh sold fell continuously from 2·09d. in 1932-3 to 1·44d. in 1940-1. Since then it has risen to 1·47d. in 1941-2 and 1·63d. last year. So far the 1941 advance in charges has been the only one since the beginning of the emergency.

At March 31st last gross capital expenditure was £17,565,982, the amount spent on additional plant placed in commission during the year being £329,389 (generation, £19,236; transmission, £75,979; distribution, £212,947; and equipment, transport, etc., £21,227).

Water-Power Developments

The date on which the Liffey hydro-electric plant will be brought into operation is still uncertain. Civil engineering construction works have been finished and the reservoirs at Poulaphouca and Golden Falls filled, but certain portions of the mechanical and electrical equipment have not yet been delivered. With regard to other projects, it is reported that plans for a hydro-electric development at Leixlip, on the Lower Liffey, are nearing completion. The greater part of the work necessary for the submission of possible schemes for harnessing the River Erne has been finished and hydrometric surveys of other rivers, including the Boyne, Lee and Barrow, have been advanced.

During the year a comprehensive report was submitted to the Government dealing with the extension of supply to the farms.

PERSONAL and SOCIAL

News of Men and Women of the Industry

LIVERPOOL City Council has adopted a resolution placing on record **Mr. P. J. Robinson's** valuable services to the city and country during the sixteen years he has been city electrical engineer. As already reported, Mr. Robinson has tendered his resignation on grounds of health, but he has intimated that he is prepared to continue in office until his successor is appointed.

Mr. **Percy E. Rycroft,** M.B.E., M.I.E.E., engineer and general manager of the Great Yarmouth electricity undertaking, who was eligible to retire this month, has agreed to remain in the service of the Corporation until May 31st next.

Mr. H. F. McLoughlin

Mr. H. F. McLoughlin, M.I.E.E., has resigned his office as chairman and managing director of J. A. Crabtree & Co., Ltd., and has also retired from the board of Crabtree Electrical Industries, Ltd., the holding company. Mr. McLoughlin, who was the first governing director of Simplex Electric Co., Ltd., joined the Crabtree concern in 1933 and was appointed managing director in 1936, following the death of Mr. J. A. Crabtree, the founder of the firm.

Alderman J. W. Rayment, chairman of the Lincoln Electricity Committee, has been appointed an honorary member of the Council of the Incorporated Municipal Electrical Association for the ensuing year.

Mr. Norman G. Allen, M.A., has been appointed a director of W. H. Allen, Sons & Co., Ltd. This appointment, which is largely in connection with the technical side of the business, brings to the board the second member of the third generation of the family. Mr. Norman Allen is a grandson of the late Mr. W. H. Allen, who founded the firm in 1880, and the second son of Mr. Harold G. Allen, whose eldest son, Mr. W. Kenneth G. Allen, became a director in 1937. The other three members of the board, Sir Richard W. Allen (chairman), Mr. Harold G. Allen (deputy chairman) and Mr. Rupert S. Allen (managing director), are sons of the founder. Mr. Norman Allen is an associate member of the Institution of Mechanical Engineers and the Institution of Naval Architects.

Mr. Norman Allen

Mr. J. Bell, of Ashton-under-Lyne, has been appointed shift charge engineer with the Warrington Electricity Department.

Mr. W. G. Swain has been appointed a director of Lancashire Dynamo & Crypto, Ltd. He has been associated with the company for a number of years and is already a director of its subsidiary, Crypto, Ltd.

Professor F. C. Lea, D.Sc., O.B.E., Wh.Sc., has been elected a vice-president of the Junior Institution of Engineers.

Mr. J. W. Horton and **Mr. J. H. Williams,** joint general managers of A. C. Cossor, Ltd., have been elected to the board of the company. Mr. Horton will continue as secretary.

Sir Frederick Whyte has been appointed a director and elected chairman of Vactric, Ltd.

Obituary

Mrs. Barham.—We regret to learn of the death on July 18th, of Mrs. Barham, wife of Mr. A. W. Barham, chief engineer and manager of the Watford Electricity Department. She took an active part in the work of the Electrical Association for Women.

Mr. Robert Morrison Abraham, M.I.E.E., F.R.A.S., a director of C. F. Casella & Co., Ltd., scientific instrument manufacturers, died on July 26th, at the age of sixty-four. Before joining the company in 1911 he travelled extensively abroad and served with a firm of consulting engineers specialising in railway signalling. He wrote a book on surveying instruments and was an authority on violins, of which he himself made several.

The *Evening News* states that **Mr. I. K. Thom** and **Mr. H. Tristram,** both of De La Rue Plastics, Ltd., lost their lives in the British Airways flying boat which crashed at Co. Kerry, Eire, last week. They are stated to have been returning from India, where they had been doing confidential work for the Indian Government.

Mr. P. S. Glover.—The death occurred recently of Mr. Percy S. Glover, chief electrical engineer, with the Furness Shipbuilding Co., Ltd., Haverton Hill-on-Tees. Mr. Glover joined the yard when it was opened in 1917 and continued with the company until his death.

Mr. D. Bremner.—The death occurred recently in London of Mr. David Bremner, partner in the firm of Bremner Bros., electricians and wireless engineers, of Forfar.

Mr. H. Tabor Brooks.—The death occurred on July 31st at Bracknell, Berks, of Mr. Harry Tabor Brooks, chairman of the Colombo Electric Tramways & Lighting Co.

Wills.—**Mr. Charles Stewart,** a director of Johnson & Phillips, Ltd., and of the Dunoon, Ringmer and Westmorland electric supply companies left £16,516, with net personalty £15,468. He bequeathed £100 to the Electrical Industries Benevolent Association.

Mr. J. W. Prescott, electrical contractor, Peterborough, who died in April last, left estate valued at £2,439 (net personalty £1,460).

Fencing Machinery

Precautions Against Breaches of Regulations

By F. E. Sugden, A.C.I.S., Barrister-at-Law

MUCH trouble has arisen in connection with the fencing of machinery, particularly where such protection is found to be difficult or impossible to provide. Apart from the payment of Workmen's Compensation, if an employer fails to carry out his statutory obligations in accordance with the Factories Act, 1937, he is also liable to penalties for a breach of the regulations.

Important issues were raised in the recent case of Whitten *v.* Army & Navy Stores. In this action the plaintiff's case was that he was operating a circular saw in a factory belonging to the defendants when, owing to the fact that the saw was not securely fenced in accordance with the requirements of Section 14 of the Factories Act, 1937, his right hand came into contact with the saw and was injured.

The defendants in the case maintained that although specific requirements called for the use of certain guards and appliances, these might be removed and that owing to the nature of the work being done the use of them was rendered impracticable. They submitted that the work on which the plaintiff was engaged came within this description and that they were thus relieved of the liability imposed by the regulation.

Factories Act Requirements

Section 14 lays down that dangerous parts of any machinery, whether prime movers or transmission machinery, shall be securely fenced unless the machinery is in such a position or of such construction as to be safe to other persons employed or working on the premises as it would be if securely fenced. The requirement is deemed to have been complied with if a device is provided which automatically prevents the operator from coming into contact with the dangerous part of the machinery.

The Court held that although owing to the nature of the work being done the use of the guard required by the regulation was impracticable, nevertheless Section 14 of the Factories Act, 1937, imposed absolute obligation to fence the machinery unless a regulation has been passed under the power conferred by Section 60 modifying that section. Section 60 of the Act lays down that where the Secretary of State is satisfied with any manufactured machinery that . . . use in factories is of such a nature as to cause risk and bodily injury to the persons employed in connection therewith or in the case of other persons, he may, subject to the provisions of the Act make a special regulation as appears to him to be reasonably practicable and to meet the necessity of the case. In this case no such regulation had been passed and therefore the plaintiff was entitled to succeed.

In view of this the Judge stated that in deciding this matter it was no excuse that the fencing of certain machinery was impracticable. In other words, commercial considerations were irrelevant and that, in so far as a machine could not be used so as to comply with Section 14 it must not be used at all. Therefore it is no argument to say that it is impossible to fence certain types of machinery; I accept that point of view, but the argument is not legally sound.

Inquiry before Purchase

My advice is that before he installs any type of mechanical device the purchaser should make himself thoroughly conversant with the Factory Regulations governing its use because he might buy unknowingly a machine of a very expensive nature, which in itself cannot be used commercially because his employees will be liable to injuries.

With regard to the fencing of machinery, an intending purchaser should first of all obtain advice from a Factory Inspector regarding the specific regulations which are applicable to the particular type of machinery in view because the Inspector must pass it before it is used.

Then if it is not considered that fencing is practicable for working conditions the purchase should not be made. It must be remembered that frequently the penalties for breaches of safety regulations are much greater than the amount of Workmen's Compensation incurred. Moreover, as a general rule, the compensation is covered by insurance, but in most cases, if not all, specific regulations are not covered by insurance.

Price of Indian Shellac

A *Reuter* report says that the Ministry of Supply, in agreement with the Government of India, has granted an additional cost allowance of seven rupees a maund on shellac and two rupees a maund on seedlac in view of the rise in manufacturing costs since the present control prices were instituted. The Ministry adds that shellac stocks in the United States are sufficient for direct war needs for two years and in the United Kingdom at least for one year.

In the Courts

Action Against South Wales E.P. Co.

IN the Chancery Division on July 28th, Mr. Justice Uthwatt concluded the hearing of an action by the Caerphilly Urban District Council against the South Wales Electric Power Co. for a declaration that notwithstanding an agreement of May 10th, 1939, made between the parties the plaintiffs are not liable to pay the defendants for electricity supplied (otherwise than for the purposes of the Caerphilly Special Order, 1922) a price higher than that fixed under the provisions of Section 12 of the Electricity Supply Act, 1926. They also also for an account of the amounts in excess of such amounts paid by them since December 31st, 1937, and the payment of the amount found to be due.

The case for the plaintiffs was that since December, 1937, the Council had taken from the defendants bulk supplies of electricity. By an agreement of May, 1939, the plaintiffs agreed to pay for all electricity supplied after December 1937, on the charges and conditions set out in the schedule. The plaintiffs alleged that the supply was not given in pursuance of a contract made in 1922 by the passing of the Electricity Supply Act, 1926, and that the higher price which the defendants had charged was not in accordance with Section 12 of the Act. It was also alleged that the price paid under the 1939 agreement had exceeded that fixed under the Act and that that agreement was *ultra vires* and invalid so far as it purported to impose on the plaintiffs liability to pay the higher price. The original contract was in 1922.

Defendants denied that the 1939 agreement was *ultra vires* or invalid. They denied that any part of the bulk supply taken by the plaintiffs was not given by the defendants in pursuance of a contract made before the passing of the 1926 Act. The supply had been lawfully given as an extended supply under the agreement of 1922. Under this they were to supply electricity to a certain point. It was agreed that the charges specified in 1928 should be substituted for those in the principal agreement of 1922. Defendants contended that there was nothing in the 1926 Act which rendered the 1939 agreement *ultra vires*.

Mr. Pritt, K.C., in opening the case said certain contracts were made between the parties for the supply of electricity. In 1926 the Company made certain charges for supply but under the 1939 agreement they charged one and two thirds more than they should have charged in respect of one area. Defendants pleaded that they were not liable, but counsel argued that they could not link the contracts up and marry the 1926 one to that of 1939. His submission was that the defendants could not make the charges they had done. The amount overpaid was said to be £4,000 a year, paid for some years.

Mr. Craig Henderson, K.C., for defendants, contended that the plaintiffs were not entitled to be repaid any money. He submitted that the contract was a legal one.

Mr. Pritt submitted that the agreement was on price terms and that Section 12 applied.

Mr. Henderson contended that price and terms in the two agreements meant the same thing and that the Council had nothing to complain about.

After hearing the evidence and counsel's speeches his Lordship reserved judgment.

Instrument Patent Appeal

The Court of Appeal, consisting of the Master of the Rolls and Lords Justices Luxmoore and du Parcq, on July 31st heard an appeal by the Automatic Coil Winder and Electrical Equipment Co., Ltd., from a judgment given against it by Mr. Justice Uthwatt in an action which it brought against Taylor Electrical Instruments, Ltd., for alleged infringement of a patent.

The patent in question was No. 423,199 for electrical measuring instruments and the plaintiffs alleged that the defendants' "Taylor Model 81c" was an infringement of it. The defendants challenged the plaintiffs' claim and alleged that the patent was invalid by reason of prior publication and prior common knowledge in relation to variation of galvanometer sensitivity and to the means required to preserve a constant resistance across the terminals of a galvanometer. They further alleged that the invention was obvious and did not involve any inventive step and was not useful. Plaintiffs denied all these allegations. Mr. Justice Uthwatt found for the defendants, holding that the invention had been anticipated by common knowledge and that it "lacked inventiveness."

Mr. Shelley, K.C., who appeared for the appellants, said that at the trial Dr. W. H. Eccles gave evidence to the effect that the invention was anticipated by students in laboratories in the course of their work. On the other hand Sir James Swinburne had expressed the opinion that it was a very good invention.

After long legal argument the Master of the Rolls said that the Court would give its judgment on the first claim as to the validity of the patent in October. After that the other claims of the appellants could be argued if necessary.

Cable Excavation Accident

At Manchester Assizes last week judgment for £820 and costs was given by Mr. Justice Lewis in favour of Mrs. Ada Bailey, Sandringham Drive, Bredbury, who claimed damages against the Standard Telephones & Cables Ltd. Mrs. Bailey fell into an excavation in Carrington Road, Stockport, in September last year and sustained severe injuries to her right shoulder. For the defence it was claimed that Mrs. Bailey had tried to walk between a tram and the excavation and must have known it was unsafe.

Damages for Broken Knee-cap

At Manchester Assizes (Civil Court) last week, Mr. Bernard Markwell (44), electrical maintenance engineer, of Bury, was awarded £710 damages and costs against the Metropolitan-Vickers Electrical Co., Ltd. Plaintiff claimed damages for a broken knee-cap which prevented him from carrying on his work.

COMMERCE and INDUSTRY

Substation Warning Notices. *Liverpool Joins District Board.*

Electricians' Allowances

BY an agreement between the National Federated Electrical Association and the Electrical Trades Union the war increase of 6d. per night in the country allowance payable under Clause 13 (a) of the National Working Rules is to be increased to 1s., making a total of 4s. per night. Men in receipt of this allowance are to be paid for time in excess of half-an-hour taken to reach their work from their lodgings and *vice versa* and the excess above 6d. per day incurred in travelling expenses. Travelling time and fares are not to be paid when men working under Clause 13 (d) work through the periods specified, but the men will receive another period in lieu of the specified period within the two weeks immediately following.

Fares from the employer's shop to the site of a job will be paid under Clause 13 (a) except where a man leaves the job of his own free will within a calendar month of the date of his arrival or where he is dismissed for misconduct.

The new agreement takes effect as from the first pay day in August for the period covered by that pay day.

Factory Regulations

Since the second edition of "The Factories Act, 1937" by H. Samuels, M.A., Barrister-at-Law, was published at the beginning of the war, industry has been brought to an increasing extent under Government control and many new Orders and regulations have been made. Consequently it has been thought desirable to publish a supplement dealing with these changes. It is published by Stevens & Sons, Ltd., 119, Chancery Lane, W.C.2, at 5s. net (or with the main work 33s.). The subjects dealt with include the extension of hours for women and young persons, lighting standards, canteens, and medical and welfare services.

Danger Notices to be Restored

In May 1940, the Electricity Commissioners issued a circular letter to all electricity undertakers suspending until further notice the requirements of paragraph (b) of Regulation 9 of the Electricity Supply Regulations, 1937, as it was considered undesirable that the existence of important substations should be emphasised by the presence of danger notices or labels in the circumstances then prevailing. At the same time, the Commissioners also advised that the existing danger notices or labels on important substations, etc., should be removed or obliterated at an early date and suggested that in cases where that was done notification should be given by the undertakers to the police and/or the local fire brigade of the location of the substations, etc., to be dealt with.

Representations have recently been made to the Commissioners by the Fire Service Department of the Home Office pointing out that the latter procedure does not appear to have been adopted in every case; that the institution of the National Fire Service has led to a considerable interchange of personnel; and suggesting that in view of the changed conditions now prevailing as compared with those in 1940 consideration should be given to the restoration of the danger notices with a view to avoiding inconvenience and possible danger to firemen.

After consultation with the Joint Committee of Electricity Supply Associations and with the concurrence of the Security Executive, the Electricity Commissioners are withdrawing as from September 1st, their suspension of the requirements of paragraph (b) of Regulation 9. Electricity undertakers should accordingly restore, as soon as practicable, danger notices or labels as required by Regulation 9. In cases where the area of supply includes urban and rural portions, the Commissioners suggest that the undertakers should concentrate in the first place on the restoration of the notices on substations, etc., in the built-up portions of the area of supply.

Production Planning

The Ministry of Labour and National Service, in conjunction with the Board of Education and the Scottish Education Department, is organising courses of lectures on production planning at various technical colleges throughout the country. The lectures will cover the following subjects:—Workshop organisation and layout of plant; the operation lay-out; materials; control of quality; motion and time study; final operation lay-out; and workshop economy. No fees will be charged.

The courses are intended for men and women engaged on planning work or with experience of such work and others with comparable experience who are capable of benefiting. The syllabus can be directed towards the requirements of most industries if there is sufficient local demand. Names and addresses of persons put forward by their employers or applying on their own account should be sent to the local Employment Exchange with full details of technical experience and present employment. Persons who have applied will be notified when the number of applications justifies the establishment of a course in their locality. An examination will be held at the conclusion of each course and a written statement will be given to those who pass to the effect that they have attended the course and passed the examination successfully.

Salary Questions at Liverpool

Representations have been made to the Liverpool Electric Power and Lighting Committee that it should apply the National Joint Board schedule of salaries to certain members of the technical staff and that the Committee should become a constituent member of the North Western District Joint Board. Authority has been given for the city electrical engineer and the town clerk to interview the employers' side of the District Board in regard to the grading of the officials mentioned in the application. It was decided to become a member of the Board.

At the meeting of the City Council on July 28th, Alderman Hogan opposed a decision of

the Electric Power and Lighting Committee declining to receive a trade union deputation in reference to matters of dispute concerning the Clarence Dock and Lister Drive power stations. He said the action taken was not in line with the policy of the Council. After Alderman Shennan had said that the Council had always upheld the desirability of trade union deputations, Alderman Critchley agreed to withdraw the Committee's resolution.

The facts which led to the Committee's decision are that the district secretary of a trade union asked for the establishment of works committees at the Clarence Dock and Lister Drive power stations and for increased wages for the pump drivers. The Committee decided that no useful purpose would be served by the establishment of such committees and considered that the point about wages was one for the District J.I.C.

The Steam Boiler Yearbook

Particular attention has been paid in the 1943 edition of the "Steam Boiler Yearbook and Manual" to the now especially important subjects of fuel economy and heat utilisation and conservation, six long chapters embodying thirty-one papers and articles dealing with different aspects of the problem being included. Otherwise the book, while following its original arrangement, has been extensively revised to include as many modern developments as space permits. A most useful addition is an appendix giving a summary of all the British Standard Specifications pertaining to steam boilers and related plant. The book (pp. 552; figs. 396) is edited by Sydney D. Scorer and published by Paul Elek (Publishers), Ltd., Africa House, Kingsway, London, W.C.2, at 30s. 10d. post free (31s. 6d. abroad).

New Zealand's Electrical Imports

During the first quarter of this year the value of electrical apparatus (excluding radio) imported into New Zealand was £N.Z.377,746. The largest item was electric motors (£57,533) of which Great Britain's share was valued at £39,398, that of the United States at £8,826, Canada £8,202 and Australia £1,107. Next in order were insulated wires and cables (£54,679)—Great Britain £31,631, United States £20,513, Canada £1,994 and Australia £541. Lamp imports amounted to 577,933 valued at £29,624, of which £23,810 was attributed to Great Britain and £5,357 to the United States.

Imports of radio apparatus had a value of £63,923. By far the largest part (£47,188) came from the United States; Great Britain's share amounted to £11,896.

"Infray" Coatings

The registered trade name "Infray" has been applied to industrial paints and varnishes, or other coatings, suitable for drying by infra-red ray radiant heat, which are obtainable from Pinchin, Johnson & Co., Ltd., 6, Arlington Street, London, S.W.1. Some of them are specially constituted for the purpose, others can be adapted for particular needs and some are naturally suited to the process. In a booklet expressing willingness to be consulted on the subject the company stresses the fact that it is not concerned with the sale or exploitation of any particular equipment for processing such coatings, but only with the formulation and provision of materials appropriate to the intended purposes both as regards conditions of application and ultimate effects of usage.

Control of Asbestos

The control of raw asbestos will, as from August 3rd, be exercised by Mr. C. J. Brockbank, who is already in control of abrasives and graphite in the Ministry of Supply. All communications relating to supplies of raw asbestos should be addressed to the Abrasives, Graphite and Asbestos Control, Palace Chambers, Bridge Street, London, S.W.1 (telephone : Whitehall 2737/8).

Rubber Conservation

A booklet, which is available for free distribution from the Goodyear Tyre & Rubber Co. (Great Britain), Ltd., Wolverhampton, has been issued in the national interest as a guide to the conservation of rubber products used in industry. Its 32 pages are chiefly concerned with belts for conveyors and elevators, power transmission and hose, dealing with their installation and inspection. The clarity of the text is enhanced by sketch drawings illustrating how service can be prolonged when precautions are taken to avoid injury.

Holidays at Home

In connection with the campaign to encourage workpeople to spend their holidays at home the Brush Electrical Engineering Co., Ltd., arranged an attractive programme for its employees and those of its subsidiary companies during last week. The Holidays-at-Home Committee, of which Mr. A. P. Good is the chairman, engaged an impressive array of bands and artistes, including the band of the R.A.F. Regiment, a number of well-known dance bands and, on the final day, a concert by the London Philharmonic Orchestra, conducted by Dr. Malcolm Sargent. Other attractions included a circus, bowls, cricket, tennis, handicraft and horticultural exhibitions, a whist drive and an all-star variety show.

Flameproof Equipment

The customary quarterly list of electrical apparatus, mining and industrial, for which certificates of flameproof enclosure were granted during the three months ended June, 1943, has been issued by the Ministry of Fuel and Power (Coal Division). At the request of B.E.A.M.A. a few copies are obtainable for 1s. 2½d. each post free from the Library, Ministry of Fuel and Power, Kings Buildings, Dean Stanley Street, London, S.W.1.

Overseas Standards

Copies of seventeen standard specifications which have recently been received from overseas are available for inspection at, or may be obtained on loan from, the British Standards Institution, 28, Victoria Street, London, S.W.1, as follows:—

American Standards Association.—C.35.1/43 (A.S.W.W. No. 11), rotating electrical machinery of locomotives and rail-cars, trolley, gasoline-electric and oil-electric coaches; C.68.1/42

(A.I.E.E. No. 4), measurement of dielectric test voltages; and C.57.1/42, transformers, regulators and reactors.

Federal Specifications (U.S.A.).—WH.1.561, laminated asbestos insulation; WC.601a, wire for cable connectors; WD.286, short-wave diathermy apparatus; and JC.86, flexible cotton covered cable, cord and wire.

National Bureau of Standards (U.S.A.).—CS.(e) 107/43, commercial electric refrigerators; and CS.105/43, mineral wool for low temperature insulation.

Canada.—C.22.2 No. 75, synthetic insulated wires and cables; No. 78, varnished-cloth insulated wires and cables; and No. 79, weatherproof (neutral type WPN) wires and cables. Revisions: C.22.2 No. 48, non-metallic sheathed cables and cords; and No. 51, armoured cables and cords.

Australia.—(E) C.502/43, rubber cables and flexible cords; (E) D.3003/43, wooden separators for accumulators. Addendum to S.A.A. (E) CA.501, cords for interior illumination of buildings.

Wire Cutters

Wire cutters are an additional accessory to the wire binding and marking system of Hellermann Electric, Ltd., Goodtric Works, Brewer Street, Oxford. Small wires and flexible cords, either bare or covered, are easily trimmed with these strongly made cutters, which resemble scissors. One blade has a serrated edge, which holds the wire in position while it is being cut by the other blade, which is plain.

Fatalities

An inquest was held recently on Joseph William West (53), a semi-skilled fitter, of Fleet End, Warsash, who received a fatal shock while using an electric hand drill at the works where he was employed. Mr. Lewis Newman, maintenance charge-hand electrician, stated that the plug wiring was faulty. Dr. D. A. Windermer gave evidence that deceased was suffering from a very serious heart condition and said that an electric shock would have a particular effect in his case. A verdict of " Accidental death " was recorded.

A verdict of " Accidental death " was returned at an inquest upon Francis McLoughlin (39) last week. McLoughlin, who was a crane driver, received a fatal shock when the jib of his crane came into contact with an overhead line at a quarry at which he was working.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following British trade marks. Objections may be entered within one month from July 28th :—

STEAM-O-MATIC. No. 621,558, Class 9. Electric flat irons incorporating a steaming device.—Steam-O-Matic Corporation, Milwaukee, Wis., U.S.A. Address for service:—c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.

ALTEGO. No. 623,347. Class 9. Electric cable and electric wire.—Sterling Cable Co., Ltd., 25, Queensway, Enfield, Middlesex.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Planning Rural Development

MR. H. WILSON'S proposal to facilitate extensions of electricity supply in rural areas (*Electrical Review*, July 9th) deserves every help. " No one has a right to a purely critical attitude—throwing brickbats at toiling workers," said Mr. Churchill recently.

I have taken from the Electricity Commissioners' pre-war returns the nature of the capital raised by electricity suppliers. The returns show that fifty authorised undertakers had loans up to 99·5 per cent. of the total capital with interest at 3 per cent. upwards.

The Commissioners' returns do not concern themselves with those would-be consumers without possibility of supply, but " Garcke's Manual " shows that of the 486 undertakings providing such information (268 local authorities and 118 companies) only 31 local authorities and 7 companies supply electricity to 96 per cent. or more of the premises in their areas. There are 66 local authorities and 78 companies who serve only 60 per cent. or less of the premises; these could certainly benefit by Mr. Wilson's proposal that loans should be available at 2 per cent. or less, or even free of interest.

Herne Bay, Kent. THEODORE STEVENS.

Another I.E.E. Wireless Group

South Midland Proposal

FOLLOWING the example of the North-Western Centre, the South Midland Centre of the Institution of Electrical Engineers contemplates the formation of a Wireless Group. In a letter to the members the chairman (Major R. H. Rawll) says that it is proposed that the group shall include within its scope " All matters relating to the study, design, manufacture or operation of apparatus for communication by wave radiation, for high-frequency engineering, or for the electrical recording and reproduction of sound." The term " high frequency engineering " is held to include the engineering of the application of electronics to industry.

To enable the Committee of the Centre to decide whether the proposal shall be proceeded with a questionnaire is being circulated to the members asking them whether they are already members of the Wireless Section; if they are connected with or interested in any form of wireless or high-frequency engineering; and where, if they support the idea, they would like group meetings to be held. It is requested that the form shall be returned to the hon. secretary, Mr. H. Hooper, 65, New Street, Birmingham, within a fortnight of August 3rd.

ELECTRICITY SUPPLY

Post-War Housing Policy. Leeds Price Increase.

Blackpool.—VIEWS ON REORGANISATION.—The Electricity Committee has expressed the view that no revolutionary or drastic change on the distributive side of the electricity supply industry is necessary or desirable, and that bulk supplies should be given to all authorised undertakings at a uniform tariff.

Chester.—RURAL SUPPLIES.—The Electricity Committee is to make arrangements for a supply of electricity to two farms.

Corby.—STREET LIGHTING.—Modified street lighting is to be installed on bus routes where not already provided, the Urban District Council having accepted Kettering Electricity Department's estimate for 32 installations.

Edinburgh. — MODIFIED LIGHTING — The Streets and Buildings Committee has agreed to a scheme for modified lighting in the central areas of the city.

Huddersfield.—JUBILEE.—July 29th marked the fiftieth anniversary of the starting up of the first electrical plant at St. Andrew's Road. Contracts for the work entailed originally the sum of £29,693. The foundations were commenced in May, 1892, and the engines were started on July 29th, 1893, at which time 83 people put in requests for electricity supply.

Hull.—POST-WAR HOUSING DESIGN.—The installation of electrical equipment in post-war houses was discussed at a recent meeting of the Electricity Committee. Alderman F. Holmes considered that such appliances as wash-boilers and refrigerators should be installed and brought within an inclusive rent, or on hire-purchase terms. On the other hand, Councillor R. E. Smith, visualising a shortage of materials, suggested that there should be some form of communal wash-houses and drying blocks which would do away with the need for each house to have its own appliances. To this Councillor K. Percival replied that the Baths Committee proposed to provide public wash-houses on all large estates. The general manager (Mr. D. Bellamy) stated that future developments had been anticipated. The Electricity Department's views had been set out in a book a copy of which had been passed to the city architect, whose ideas on future housing included extended electrical facilities. It was now for the Housing Committee to adopt that policy. A resolution was passed recommending the closest co-operation between the Electricity and Housing Departments.

Leeds.—HIGHER CHARGES.—The City Council last week approved a recommendation of the Electricity Committee that charges to all consumers should be raised by 10 per cent., with a small additional increase to users for power purposes. Sanction for the increases will have to be sought, but the increases have been discussed with the Electricity Commissioners. Proposing the resolution Mr. C. A. Goodall, chairman of the Electricity Committee, pointed out that in the last three years there had been no increases owing to the opposition of the Electricity Commissioners. The Department's reserve fund was now being seriously depleted. The Committee wanted to charge increases to power consumers only, but the Commissioners insisted on an all-round 10 per cent. increase.

London. — HEATING DAY NURSERIES. — Hammersmith Borough Council has been authorised by the Ministry of Health to spend £712 on electrical installations for heating day nurseries.

Newcastle (Staffs).—SUPPLY TO COLLIERY.—At a cost of £1,000 the Electricity Committee is to provide an e.h.v. overhead cable, switchgear and transformer to supply electricity to a colliery.

Nottingham.—PRICE REDUCTION CRITICISED.—When the annual report of the Electricity Committee was presented to the City Council Councillor J. Littlefair stated that if the black-out and fuel economy campaign continued the accounts for next year would inevitably show a loss unless something were done in the meantime. The charges had been reduced because the previous year's accounts showed a substantial profit, but never was there a time when industrialists were less in need of financial assistance or when the small consumer could better afford a reasonable charge for electricity. He claimed that they were now selling electricity to consumers as a whole at a price below cost.

Councillor F. Carney submitted that it was absolutely wrong to suggest that they were selling electricity under cost, although a certain class of consumer obtained it at less than the purchase price plus service charges.

Councillor J. Willbery remarked that charges might have to be reconsidered if the fuel economy campaign continued. For three years, however, the undertaking had made a substantial profit, more than it ought to have done. Whatever changes were made in charges they should be made with equity. One class of consumer should not receive electricity at less than cost.

Oldham.—MINIMUM CHARGES SUSPENDED.—By the Electricity Committee's decision to waive the minimum charge of £1 per annum the undertaking will lose about £500 per annum. This step was taken after Mr. E. Binns (joint manager) had reported that about 50 persons, old age pensioners and soldiers' wives, had asked to be excused making the minimum payment on grounds of hardship. The alteration dates from April 1st of this year and will continue until the end of the war or until such time as the Committee directs.

Paisley. — UNDERTAKING'S DEFICIT. — The Electricity Department, after two years of considerable profits, closed the past year with a loss. It is not proposed to make any alteration in charges, which were reduced in February, 1942, but the position may be reviewed during the year if need arises.

Stalybridge.—INCREASED GRANT FROM PROFITS.—A sum of £20,000 is this year being divided equally among the four constituent authorities of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board for the relief of the local rates. The grant, made from the

Board's profits for the past year, is the highest ever voted and is an increase on the amount recommended by the Board's Finance Committee (£4,000 to each authority). It raises the total sum granted since the Board's inception to £93,000 and compares with precepts aggregating £144,000 in the earlier days to make up deficiencies. No precepts have been levied during the past twenty years.

Swansea.—ELECTRICITY AND POST-WAR HOUSING.—When the Housing Committee last week considered proposals relating to its post-war housing policy the borough architect (Mr. Ernest Morgan) foreshadowed a great extension of electrical facilities. The housewife, returning from the Forces and war work, would have been using electrical devices and would expect such things in her home, he said.

The borough electrical engineer (Mr. H. E. Blackiston) showed the Committee an electric clock he had designed in the form of a grandfather clock. The idea was to have the clock with a mirror in the front of the body and a bracket light on top set in the wall in the hall.

The Committee approved a scheme for the erection of 457 houses in the first post-war year on sites which are already owned by the Corporation.

Watford.—MODIFIED LIGHTING.—At a meeting of the Highways Committee it was reported that the Ministry of Home Security raised no objection to proposals to extend the installation of "starlight" street lighting. The cost is estimated at £338.

Overseas

Canada. — POST-WAR PROGRAMME. — The Canadian Electrical Association has proposed a $1,000,000,000 post-war programme and has appointed a Ways and Means Committee to "co-ordinate the plans of Association members along lines meeting with governmental regulation and approval." The announcement, made at the end of the Association's three-day annual convention, said that the objectives of the programme will include: maximum employment; rural and farm electrification; the further modernisation and extra extension of electric power systems; production of electrical appliances for the low-income group; conversion of wartime plants to peacetime production; and application of electricity to transport.

The announcement gave no further details of the proposed programme, but it was learned that the Ways and Means Committee is holding meetings during the summer with the view to learning what the various Association members have budgeted for post-war expenditure and what lines their individual programmes will follow. The Committee's preliminary work will probably be followed by a general conference this autumn at which the Association will seek to co-ordinate the programmes of the various members and lay plans to co-operate in any government expansion programme to assist employment.

SIXTH UNIT AT SHIPSHAW.—*Electrical News and Engineering* (Toronto) reports that the sixth unit at the Shipshaw plant of the Aluminum Company of Canada was recently brought into commission. This marks the half-way stage in the construction of what will shortly be one of the largest centres of power production on the continent. The starting of the first two units was reported last November. In all there are to be ten 85,000-HP and two 55,000-HP generating sets.

France.—BAN ON DOMESTIC APPARATUS SALES.—It is officially announced that the sale and hire of all electrical household appliances is to be prohibited. Stocks of such appliances will be "frozen" and their sale will be restricted to holders of special permits.

RADIO AND TELEPHONY

Brazil.—SHORTAGE OF MATERIALS.—Reporting on its operations during last year the Brazilian Telephone Co. states that the number of telephones in service increased from 244,993 to 261,549. While, however, a certain amount of progress was made, the growth of the undertaking was hampered by the company's inability to obtain all the necessary equipment as a result of war conditions. The lack of new material was severely felt in São Paulo. Several shipments were, however, received towards the end of the year but it is added that the completion of the orders for materials and of the work of installation is likely to be delayed. The position in the Federal District of Rio de Janeiro is very much the same, a certain amount of equipment having come to hand that will tend to relieve the situation. The automatic telephone equipment for the city of Petropolis has been received and it is reported that part of it is now in service.

In December last a Federal decree was issued laying down the general lines to be followed by the States throughout Brazil when exercising their powers to legislate in connection with telephone communication. It is feared that these, if too rigidly interpreted might well cause hardship to companies operating under State concessions and militate against the expansion of the services.

South Shields.—POLICE RADIO.—The Home Office has approved the establishment of a joint wireless service for the police forces of South Shields and Tynemouth.

TRANSPORT

Bournemouth.—PROPOSED TROLLEY-BUS LINK.—The Transport Committee is seeking sanction to operate trolley vehicles along Lansdowne Road for the purpose of connecting two existing trolley routes.

South Shields.—LOAN FOR TROLLEY-BUS EXTENSION.—Application is being made to the Ministry of Transport by the Town Council for sanction to borrow £4,302 for expenditure in connection with the extension of the trolley-bus service in Commercial Road and Centenary Avenue.

Electrical Housecraft Certificates

The sixteenth E.A.W. Certificate Examination in Electrical Housecraft for demonstrators and saleswomen was held on June 17th, when 31 candidates qualified for the certificate. Examination centres were at Manchester, Walthamstow, Wolverhampton, Sheffield, Shrewsbury, Douglas, I.O.M. and Cheltenham. The total number of E.A.W. certificate holders is now 888.

Misalignment

Foundations of Mechanically Connected Machinery

By E. L. Parry,
A.M.I.Mech.E., A.M.I.Mar.E.

ALTHOUGH cast-iron underbases for the support of mechanically connected machinery are being superseded to a large extent by built-up or welded-steel underframes, the former type of underbase often appears to be still in favour with makers of certain classes of plant. Both types possess qualities that must be considered before a decision is made as to the most suitable one to use, and in some applications the solution may lie in a combination of both.

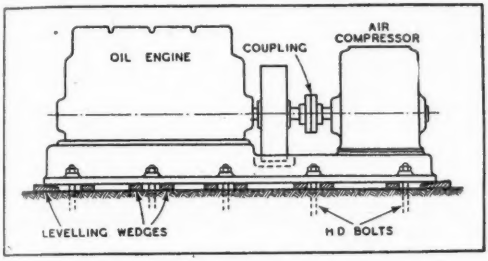

Fig. 1.—Arrangement of oil-engine-driven compressor

There is often too rigid an adherence to the dictum that correct alignment can only be assured if the whole of the plant is mounted on and supported by a common underbase, but this can sometimes best be dispensed with. Cast-iron underbases can be deformed and twisted without fracture or can assume a permanent set and built-up steel underframes can be bent in transit or by faulty handling at site.

Recently I was requested to report on a range of oil-engine-driven air compressors which were alleged to be faulty in workmanship on account of the considerable bearing trouble that was experienced during preliminary trials at the purchasers' works before shipment abroad. Each unit was mounted on a common cast-iron underbase, the components being connected together by means of a flexible coupling (fig. 1); the bearings exhibited all the usual symptoms associated with misalignment and all that appeared to be necessary was to carry out a thorough alignment check of each of the five complete units.

In view of the unevenness of the floor upon which the units were temporarily installed, levelling wedges were provided and the units were held secure by means of five anchor bolts on each side of the base-plates. These bolts, however, were so located that the spaces between each provided convenient bridges that enabled the underbase to be sprung to such a varying amount that no two units, although of identical design, gave similar alignment readings.

The underbases were of a design that conformed to the makers' description that they "were of ample proportions and suitably ribbed." Yet we had a clear demonstration of the phenomenon that cast-iron, even in well-designed plant, can be distorted and that, where it is in the form of a base-plate and is not supported throughout the full area, it can contribute to misalignment troubles. It is therefore essential that the cement grout should form a solid mass between the underside of the base-plate and the top of the supporting floor or foundation, as shown in fig. 2.

A method that can often be used to advantage as an alternative to the ordinary types of underbase is that of having separate sole-plates or independent metal pads, as shown in fig. 3; these provide ample latitude for adjustments to the plant in addition to facilitating the substitution of different plant without involving serious alterations to the existing foundations or holding down bolts. The

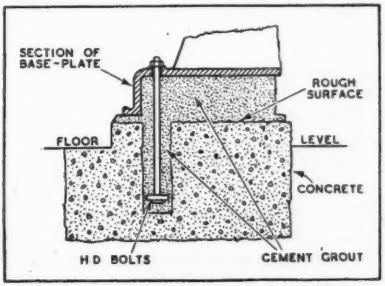

Fig. 2.—Solid cement grout required to avoid distortion

metal pads (a) and (b) are cast-iron tapered inserts, the one shown at (a) is tapped to accommodate a set-screw for anchoring the machine, but where lateral

(*Continued at foot of page* 184)

London J.E.A.

Authority's Reply to Conference Resolution

IT was reported in the *Electrical Review* of July 23rd (p. 110) that the Conference of Local Authorities Owning Electricity Undertakings in Greater London had passed a resolution expressing opposition to the plan for the reorganisation of electricity supply in the London Electricity District prepared by the London and Home Counties Joint Electricity Authority.

This resolution has been considered by the General Purposes Committee of the J.E.A. which refers to the Conference's re-affirmation of principles which it enunciated in 1937 upon the occasion of the publication of the Government's suggestions for reorganisation laid down in the White Paper, "Outline of Proposals." The Committee claims that these principles put forward by the Conference in 1937 have in fact been applied in the proposals adopted by the Authority in March last to the London and Home Counties Electricity District. The principles included "full complete and direct public ownership and control" and the establishment of a separate Ministry to deal with electricity generation, supply and distribution. The Government's proposals were considered to be "wholly unacceptable."

A further resolution passed by the Conference at its July meeting called for the granting of powers to a competent authority (such as the Electricity Commissioners) to compel the standardisation of systems and voltages of supply and uniformity of methods of charge and form of tariffs, including method of bulk supply charges. The J.E.A. Committee maintains that these points are specifically dealt with in the Authority's proposals so far as the London and Home Counties District is concerned.

The chairman of the Committee, who is a member of the Conference, invited the Conference to appoint a sub-committee to meet representatives of the J.E.A. in an endeavour to reconcile any differences which existed. This invitation was not accepted, although the proposal received substantial support.

Points of Difference

A summary by the Committee of the opinions expressed in reply to the J.E.A.'s proposals reveals that differences of opinion may arise on four points. The first is that the Authority's proposals should be considered as part of a national scheme of public or local government ownership and control. Secondly the size of the proposed electricity district and the grouping of undertakings may be questioned. Thirdly there may be divergence of views regarding the terms of requisition of undertakings by a central body. Fourthly some favourably situated undertakings may be placed at a disadvantage.

With regard to the first point, the Committee says that such an approach must depend on and would be helped by a definite statement of policy or intention by the Government and Parliament. The Authority's plan can only be regarded as a substantial step in the direction suggested. It is considered that differences of opinion on the other three points should be surmountable in view of the agreement on principles.

To correct misleading statements and for general information the Committee sets out details of the improvements effected by the Authority in its distribution since it commenced operations in 1930–32. It is shown

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Misalignment (*Continued from page* 183)

movement must be provided for the tee-slotted insert (b) may be used. The advantage of this type of anchorage is that the uppermost surface can be machined so as to permit more accurate setting. Further, the task of removing the machine is simplified by removal of the anchor bolt, which obviates the usual troubles encountered through projection of the bolts above the floor when these are permanently grouted into the concrete.

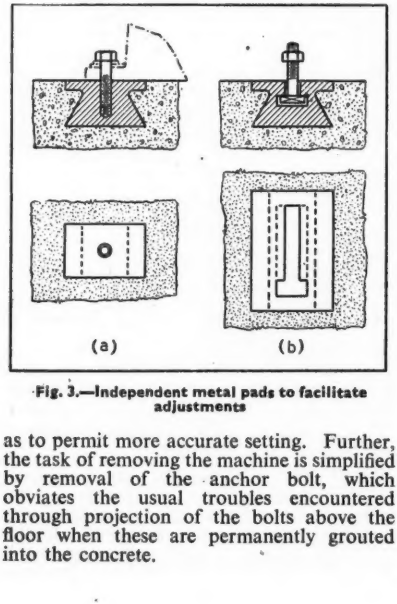

Fig. 3.—Independent metal pads to facilitate adjustments

that the number of consumers rose from 33,000 in 1929 to 129,000 in 1938 and the sales of electricity from 21 million to 144 million kWh. The average price for lighting and domestic heating and power was reduced from 5·10d. to 1·73d. per kWh, while the average price paid by two-part tariff consumers was 1·42d. per kWh in 1938. About 82 per cent. of the consumers were on the two-part domestic tariff. At the same time tariffs and systems of supply have been unified.

Consumers' Economy

The chief engineer (Mr. F. W. Purse) and the finance officer (Mr. A. L. Burnell) have completed a third survey to test the response of consumers to the appeal for economy in the use of electricity. As before, five hundred consumers were approached half of whom had an increased consumption during the March quarter and half with smaller consumptions. About half of the 168 replies received from the latter class attributed the saving to simple economy. Variation in household circumstances coupled with economy was given as a reason in 40 instances.

In the case of excess consumption 198 replies were received and variations in domestic arrangements were said to account for the increase in 116 cases. The fact that more (and prompter) replies were received from this class is particularly noted.

The survey is held to confirm the views previously expressed that consumers are co-operating in the economy campaign; that reasons given for increased consumption are such as would merit and receive consideration under a rationing scheme; and that further, compulsory, economies would impose real hardship in many cases. It is thought, however, that materially greater economy could be achieved if all consumers accepted the degree of hardship voluntarily shouldered by some of their number.

The investigators consider that the more stringent conditions of the present time are educating consumers in the advantages of electricity for domestic use more successfully than much of the advertisement directed to that end in pre-war days.

The Local Distribution Committee reports that records of consumption during the past twelve months show a reduction of 8·46 per cent. as compared with the preceding year.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Ward & Goldstone, Ltd.—The net profit for the year ended March 31st last was £28,289, as compared with £40,177 in the preceding year, after providing for all charges, employees' benevolent scheme, depreciation, war damage insurance, etc. The reduction is stated to be due to adjustments and increased provision for reserves and taxation. The dividend on the ordinary stock is maintained at 20 per cent. by a final payment of 10 per cent. and it is proposed to transfer £10,000 (against nil) to general reserve, making it £120,000, and leaving a balance of £40,101 to be carried forward.

In a statement accompanying the accounts the chairman (Mr. H. Goldstone) says that the company has operated in the plastics branch of the industry for about twenty years; war conditions have accelerated developments, and metal and rubber shortages have opened out new fields for plastics. The company has a large and modern plant engaged in the mass fabrication of moulded and extruded products and the tool shop is well equipped for the production of moulding tools and appliances. It has been possible to maintain a substantial volume of exports and the company has thus retained its goodwill with many overseas connections.

East London Rubber Co., Ltd.—Speaking at the annual meeting on July 28th the chairman (Mr. E. P. Richardson) said that although few of the commodities with which they were concerned were exempt from Government control, the company's sales were considerably greater than in the preceding year. It had been decided to alter the company's name as it was thought that the present title was misleading and a handicap to development. The new name would be Kerry's (Great Britain), Ltd. The business was founded by the late Mr. Alfred Kerry and his name was borne by a large variety of goods which the company distributed and manufactured.

Newton Bros. (Derby), Ltd.—At the annual meeting last week, Lieut.-Col. P. C. Cooper-Parry (chairman) said that the reduction in the trading profit, before charging taxation, from £322,327 to £260,727, was not indicative of reduced activities but of reduced prices; actually, production again substantially increased during the year. The company was not well placed with its pre-war standard, which unfortunately reached back to 1936—for them a period of reconstruction and reorganisation. The year 1938-9, when their net profits were £35,342, did not enter into their standard. Several shareholders had written to him remarking on the small net return from activities so substantial. It was fair comment, but although the E.P.T. provisions operated harshly here and there, there were few who did not willingly accept the general principle of taking the profit out of war activities.

Dealing with the company's specialised products and designs, the chairman paid a tribute to Mr. Fred Newton, who was primarily responsible for these. With regard to post-war years, he said it was clear that competition both from old-established and many new firms would

be keener than ever for the inevitably lower demand. Overseas representation would become a matter of prime importance. In conclusion, he stated that a staff pensions scheme had been inaugurated and an allocation of £1,750 to a staff pension trust was recommended, making £4,000 to date.

Palestine Electric Corporation, Ltd.—Sir Edward Baron, who presided at the company's annual meeting in the absence of Viscount Samuel, said that 4,951 consumers had been added during 1942, making the total at December 31st, 88,288. Consumption of energy had increased by 19·5 per cent.

Dealing with the increase in operating expenditure, he said that 46 per cent. of this was attributable to cost-of-living allowances granted to employees, and other expenditure due to war conditions. The general cost of living in Palestine had more than doubled since August, 1939, and this had produced a grave problem which had not yet been adequately countered by measures taken by the Government of Palestine. Recommendations of a Wages Committee appointed by the Government had been largely anticipated by the company in common with other industrial undertakings in Palestine. The chairman referred to the loss which they had suffered by the death of Lord Hirst, who had been a director since 1926.

The Anglo-Argentine Tramways Co., Ltd.—Speaking at the annual general meeting on July 27th Sir Bernard Docker, the chairman, said that the new Government of Argentina had replaced all members of the Control Commission of the Buenos Aires Transport Corporation and the official representatives on the Corporation's board. The Government had ordered the Control Commission to report within ninety days on the Corporation's ability to comply with the co-ordination law ; the elimination of losses by the reorganisation of services ; adjustment of official capital, *i.e.*, capital of the Government and the Buenos Aires Municipality in the Corporation; adjustment of the Corporation's contracts; valuation of the Anglo-Argentine Tramways Co.'s assets transferred; and means of establishing official authority through national and municipal representatives on the Corporation's board. The Government had suspended the taking-over of the colectivos and buses not yet incorporated, and cancelled a former decree concerning the reorganisation of the capital of Chadopyf, whose underground railways had been taken over by the Corporation, and ordered reconsideration of the financial scheme for a settlement of that company's affairs. The President of the Republic had declared to a delegation of the Corporation's board that he wished to find a harmonious solution of the Corporation's problems. The directors of the Anglo-Argentine Tramways Co. were therefore entitled to expect that the company's rights would be respected.

Globe Telegraph & Trust Co., Ltd.—The statement of the chairman (Mr. F. A. Johnston) presented at last week's annual meeting said that the appreciation of investments over book value amounted to £2,238, 943. This was due to their former intimate connection with the large cable companies and to the subsequent low price at which the Cable & Wireless holding stood in their books. The dividend had been maintained at 5 per cent., free of tax, and the balance carried forward had been increased by £32,136. That had been due to the substitution of a National Defence Contribution for the company's E.P.T. liability with the consequent release of the considerable sum held in suspense in this connection.

Ultra Electric (Holdings), Ltd.—In a statement presented at the annual meeting on July 28th the chairman (Mr. E. E. Rosen) said that excellent progress had been made both from the company's and the national points of view. In broadcasting alone there should be a wide field for future expansion, while in television the work already done by the company would place it in a good position to take care of requirements after the war.

Electrical Finance & Securities, Ltd., is to redeem the whole of its outstanding 5½ per cent. debenture stock (£279,247) on February 1st next. It is offering to holders on a pound-for-pound basis a new 4 per cent. stock.

Metal Industries, Ltd., has declared a final dividend of 5½ per cent. on the "A" and "B" ordinary stock, making 8 per cent., against 5 per cent.

The City of London Electric Lighting Co., Ltd., has deferred consideration of payment of a dividend on the ordinary stock until the accounts are available. Last year at this time an interim dividend of 3 per cent. was declared, followed by a final distribution of 4 per cent.

The London Electric Supply Corporation, Ltd., has announced the interim dividend of 3 per cent. on its 6 per cent. £5 preference shares.

The Northmet Power Co. has again declared an interim dividend of 3 per cent.

The Farnham Gas & Electricity Co. is maintaining its interim dividend at 3½ per cent.

Richardsons, Westgarth & Co., Ltd., are again paying a dividend of 8 per cent. for the year.

The Nico Light Co., Ltd., has again declared a dividend of 7 per cent. in respect of the past year.

Mather & Platt, Ltd., announce the payment of an interim dividend of 4 per cent. (same).

New Companies

Waterhouse Engineering Co., Ltd.—Private company. Registered July 19th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical and mechanical engineering equipment, abrasive materials and wheels, acetylene lamps, cutting and welding equipment, tools, etc. Directors: J. Waterhouse and Mabel E. Waterhouse, both of Chareth, Calver, Derbyshire, and H. B. Waterhouse, 17, Shepperson Road, Sheffield, 6. Registered office: 24-26, Burgess Street, Sheffield, 1.

Wardour Manufacturing Co., Ltd.—Private company. Registered July 24th. Capital, £1,000. Objects : To carry on the business of dealers in, and hirers of, electrical plant and apparatus, manufacturers of, and dealers in, electrical, metal and other goods, etc. Subscribers : A. Fletcher, Ellerwood, Bowness-on-Windermere, Westmorland, and J. C. Cowles, 74, Dale View Crescent, Chingford. Solicitors : Fletcher & Co., 13, Bloomsbury Square, London, W.C.1.

Marston Domestic Appliances, Ltd.—Private company. Registered July 20th. Capital, £100. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in domestic and general electrical and other equipment and appliances, including washing and cleaning machines, mangles, refrigerators, radio instruments, etc. Directors: Dr. W. H. Marston, 691, Coventry Road, Birmingham, and C. C. Hyams, 14, Glebe Court, Church Road, W.7. Registered office: 2, Church Lane, Boston, Lincs.

Companies' Returns

Statements of Capital

Bray, Markham & Reiss, Ltd.—Capital, £20,000 in 10,000 6 per cent. preference and 10,000 ordinary shares of £1. Return dated January 4th. 10,000 preference and 7,080 ordinary shares taken up. £16,080 paid on 10,000 preference and 6,080 ordinary shares. £1,000 considered as paid on 1,000 ordinary shares. Mortgages and charges: Nil.

Nalder Bros. & Thompson, Ltd.—Capital £40,000 in 15,000 preference and 25,000 ordinary shares of £1. Return dated December 30th, 1942 (filed January 1st, 1943). 15,000 preference and 24,500 ordinary shares taken up. £14,064 paid. £25,436 considered as paid. Mortgages and charges: Nil.

Mullard Wireless Service Co., Ltd.—Capital, £50,100 in 50,000 "A" and 100 "B" shares of £1 each. Return dated January 12th. All shares taken up. £49,300 paid on 49,200 "A" and 100 "B" shares. £800 considered as paid on 800 "A" shares. Mortgages and charges: Nil.

Edward Dewhurst, Ltd.—Capital, £20,000 in 20,000 shares of £1 each. Return dated. December 31st, 1942 (filed March 13th, 1943). 15,672 shares taken up. £1,502 paid. £14,170 considered as paid. Mortgages and charges: £7,761 7s. 6d.

Wombwell Electrical Contracting Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1942 (filed March 4th, 1943). 462 shares taken up. £462 paid. Mortgages and charges: Nil.

Electricity Services, Ltd.—Capital, £5,000 in £1 shares. Return dated January 21st (filed February 20th). 4,975 shares taken up. £4,915 paid. £60 considered as paid. Mortgages and charges: Nil.

Flather & Co., Ltd.—Capital, £20,000 in £1 shares. Return dated January 12th. 13,208 shares taken up. £11,708 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Utilities (Manchester), Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated March 15th. All shares taken up. £5 paid. £995 considered as paid. Mortgages and charges: Nil.

White, Jacoby & Co., Ltd.—Capital, £7,500 in £1 shares. Return dated January 14th. 5,794 shares taken up. £3,437 paid. £2,357 considered as paid. Mortgages and charges: £1,200.

Chadburn's (Ship) Telegraph Co., Ltd.—Capital £120,000 in £60,000 ordinary stock and 60,000 shares of £1 each. Return dated December 9th, 1942, filed January 20th, 1943. All stock taken up. £60,000 paid. Mortgages and charges: Nil.

Electric Sign Co., Ltd.—Capital, £5,000 in £1 shares. Return dated January 14th (filed March 5th). All shares taken up. £1,000 paid. £4,000 considered as paid. Mortgages and charges: Nil.

Increase of Capital

Unit Controls, Ltd.—The nominal capital has been increased by the addition of £9,000 in £1 shares beyond the registered capital of £1,000.

Mortgages and Charges

Nigerian Electricity Supply Corporation, Ltd.—Satisfaction to the extent of £12,123, on June 30th, of trust deed dated August 24th, 1933, and registered August 31st, 1933, securing £300,000 6 per cent. first mortgage redeemable debenture stock.

Power Specialities, Ltd.—Assignment on July 16th, of proceeds of contract, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £20,000 at any one time.

Receiver Released

Corona Lamp Works, Ltd.—Walter W. B. Jackson, of 35/6, Bedford Street, Strand, W.C.2, ceased to act as receiver and/or manager on July 7th, 1943.

Bankruptcies

W. S. Scott, radio engineer, carrying on business as the West End Radio, 452, West Road, Newcastle-on-Tyne.—This debtor was granted his discharge, subject to the payment of £100, when he applied recently at the Court House, 56, Westgate Road, Newcastle-upon-Tyne. That £100 would enable a further dividend of 2s. 6d. in the £ to be paid to the creditors, making a total distribution of 4s. 4d. in the £. The receiving order was made in 1939.

E. M. Jones, electrical engineer, 26, Eastgate, Aberystwyth. Supplemental dividend of 3d. in the £, payable August 11th, at 4, Queen Street, Carmarthen.

R. L. Close, wireless dealer, Hazel Gill, Bowes, York, lately carrying on business at 6, Horse Market, Barnard Castle, Durham.—Trustee, Mr. C. L. Townsend, 80, High Street, Stockton-on-Tees, released July 24th.

Request for Investigation

IT is reported by *Reuter* that the Mayor of Buenos Aires has written to the Minister of the Interior asking that a committee should be appointed to investigate the concessions under which Buenos Aires electric light and power companies are operating. The letter points out that grave accusations have been made in the Chamber regarding the manner in which the concessions were extended by the Municipal Council which was dissolved by the former President Castillo, and that the affair has been allowed to slide by the Chamber.

STOCKS AND SHARES

TUESDAY EVENING.

THE volume of Stock Exchange business is well maintained. Every business day provides an amount of activity unusual for this time of year. Members of the House never expect to be busy during the summer, but, owing to shortage of staff and other war conditions, together with the activity in various markets, this year is certainly an exception to the general rule. Some Stock Exchange firms had the best July, from the business point of view, which they have experienced this century. Prices keep up, and there is no slackening in the demand for front-rank industrials. Speculation concerns itself with radio shares, in which market there is considerable animation.

Home Railway Stocks

The Home Railway dividends, now declared for the first half of 1943, may be said to fulfil previous expectations and to provide no fresh item of interest. Fulfilling people's hopes as they have done, these interim dividends fail to exercise any effect upon prices in the market.

London Passenger Transport "C" has recovered its dividend of 12s. 6d. net, and at 64½ shows a gain of about 30s. on the week. Southern preferred and preference stocks are ex the half yearly dividends. The former, at 75, now affords a return of £6 13s. 4d. per cent. on the money.

Electricity Supply

City of London Electric ordinary shares gave way a florin to 27s. 6d. upon the unexpected passing of the interim dividend. Consideration of a dividend on the ordinary shares is postponed until the accounts are available. These appear in March as a rule. A year ago, the interim dividend was 3 per cent., followed by a final of 4 per cent., making 7 per cent. for 1942. The present decision will lead to suggestions that the 7 per cent. rate may be reduced, but no definite news is likely to be published for another six months.

From the standpoint of yield, London Associated Electric ordinary shares are the most expensive in their group. They return barely 2¾ per cent. at the present price of 22s., taking the last-paid dividend of 3 per cent. as the basis of calculation. In the provincial list, West Gloucesters give a shade under 3 per cent. Both these companies are expected to put up their dividends in the near future. Amongst the London companies, Northmets at 36s. 6d. return a modest £3 16s. 8d. per cent. while most of the others in the same market can be bought to afford yields that range from 4 to 4¾ per cent. on the money. Isle of Thanet ordinary have been out of the dividend list for the past three years, but investment continues to absorb the shares in the hope of an early distribution.

Overseas Shares Better

Cawnpore Electrics have advanced ⅛ to 24s. 6d. Calcutta Electrics are better at 38s. 6d. and Madras at 25s. Calcutta Trams hardened to 41s. 9d. Victoria Falls Power ordinary at 85s. are ⅛ higher; the success of General Smuts in the recent elections has helped the markets in South African shares generally. Kalgoorlie rose to 9s. 6d. upon maintenance of the 5 per cent. dividend.

General Electrics

General Electric ordinary have more than regained the deducted dividend of 1s. 9d. per share net, and the price treads hard upon the heels of 90s. At the current level, the yield comes to £3 18s. 8d. per cent. on the money. The figures, the report and the chairman's statement have been received with satisfaction in the market, where it is observed, had the board deemed it advisable, the distribution could have been restored to 20 per cent. without difficulty. Enfield Cable ordinary have gained 2s. 6d. at 58s. Murex at 5¼ and Mather & Platt at 49s. are both firmer. Rises of 1s. lifted Ever Ready to 38s.6d. at which the shares still pay over 5 per cent. on the money—and British Thermostat to 18s. 6d., a price that provides the level 5 per cent. yield. Telegraph Constructions are better at 52s. De la Rue ordinary touched £8, reacting to 7⅞ upon a little selling by holders tempted to take handsome profits upon their purchase prices. British Vacuum Cleaners are better at 27s.

Callender's, Henley's and "Wires"

Callender's have been advanced to 97s. The line of shares lately overhanging the market has been nearly all placed. A couple of thousand shares at 98s. still remain available at the time of writing. The price experienced so breathless a rise when the increase of 5 per cent. in the dividend was announced, that the usual supporters of the shares evidently felt a little cautious of following the market. But it was pointed out here, on July 16th, that Callender's ordinary at their then price of 95s. compared favourably with British Insulated and Henley's. The three companies are all paying 20 per cent., and Callender's at 97s. go against "Wires" at 106s. 3d. and Henley's at 25s. 9d.—the last-named being equivalent to 103s. for a £1 share. Moreover, neither British Insulated nor Henley's can be bought, at the moment, as cheaply as the middle prices just quoted. On the eve of the outbreak of war, Callender's

(*Continued on page* 190)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Aug. 3	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	56/6	..	4 6 10
British Power and Light	6	7	31/–	..	4 10 4
City of London	7	7	27/6	–2/–	5 1 10
Clyde Valley	8	8	39/–	..	4 2 0
County of London	8	8	39/–	..	4 2 0
Edmundson's: 7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	28/6	..	4 4 3
Elec.Dis.Yorkshire	9	9	44/–xd	..	4 1 10
Elec. Fin. and Securities	12½	12½	52/–	..	4 16 1
Elec. Supply Corporation	10	10	46/–	..	4 7 0
Isle of Thanet	Nil	Nil	17/–	..	—
Lancs. Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec.	5½	6	25/6	–6d.	4 14 1
Lond.Assoc.Electric	4	3	22/–	..	2 14 10
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	39/6xd	..	4 1 0
Midland Counties	8	8	38/6	..	4 3 1
Mid. Elec. Power	9	9	42/6	..	4 4 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec.: Ordinary	7	7	32/–	..	4 7 6
7% Pref.	7	7	34/–	..	4 2 4
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	10	..	—
Northmet Power: Ordinary	7	7	36/6	..	3 16 8
6% Pref.	6	6	30/6	..	3 18 8
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	37/6	..	4 5 4
Southern Areas	5	5	22/–	..	4 10 11
South London	7	7	26/–	..	5 7 8
West Devon	5	5	23/–	..	4 7 0
West Glos.	4½	3½	23/6	..	2 19 7
Yorkshire Elec.	8	8	39/6xd	+d.	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/6	..	—
Calcutta Elec.	7*	6*	38/6	+6d.	3 2 4
Cawnpore Elec.	10	10	34/6	+2/6	5 16 0
East African Power	7	7	33/6	+1/–	4 3 7
Jerusalem Elec.	7	5	29/–	..	3 9 0
Kalgoorlie (10/–)	5	5	9/6	+6d.	5 5 3
Madras Elec.	6*	4*	25/–	+6d.	—
Montreal Power	1½	1½	29	..	5 3 5
Palestine Elec."A"	4*	5*	42/–xd	–6d.	2 7 8
Perak Hydro-elec.	6	7	9/6	..	—
Shawinigan Power	83cts.	90cts.	20¼	+¼	—
Tokyo Elec. 6%	6	6	22	+1	—
Victoria Falls Power	15	15	4½	+⅛	3 10 7
Whitehall Inv.Pref.	—	—	25/–	..	4 0 0

Company	Dividend Previous	Dividend Last	Middle Price Aug. 3	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity: 1955–60 (Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	102xd	..	3 8 8
1974–94	3½	3½	100	..	3 5 0
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	110	..	4 1 10
Lond.Pass.Trans.: A	4½	4½	117½	..	3 16 7
B	5	5	115½	..	4 6 7
C	2⅔	3	64½xd	+1½	4 3 0
WestMidlandsJ.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.: Pref.	6	6	116½	+1	5 3 0
Def.	1½	1½	29	+1	5 3 5
Anglo-Portuguese	8	8	24/–	..	6 13 4
Cable & Wireless: 5½ Pref.	5½	5½	115	..	4 15 8
Ord.	4	4	77½	–½	5 3 3
CanadianMarconi	$1	Nil	4cts.	9/6	–6d. —
Globe Tel. & Tel.: Ord.	8½*	5*	36/–	..	2 15 7
Pref.	6	6	29/3	+6d.	4 2 1
Great Northern Tel. (£10)	Nil	Nil	24½	..	—
Inter. Tel. & Tel.	Nil	Nil	17	..	—
Marconi-Marine	7½	7½	31/9	..	4 14 4
Oriental Tel. Ord.	16	10	43/–	+9d.	—
Telephone Props.	6	Nil	14/6	..	—
Tele.Rentals (5/–)	10	10	11/–	..	4 11 0
Traction and Transport					
Anglo-Arg. Trans.: First Pref. (£5)	Nil	Nil	4/–	..	—
4% Inc.	Nil	Nil	10	..	—
Brit. Elec. Traction: Def. Ord.	45	45	1075	..	4 3 9
Pref. Ord.	8	8	175	..	4 11 5
Bristol Trams	10	10	50/–	..	4 0 0
Brazil Traction	$½	$1	30	..	—
Calcutta Trams.	8	5½	41/9	+9d.	2 12 6
Cape Elec. Trams	5	6	25/6	..	4 14 0
Lancs. Transport	10	10	44/3	..	4 10 4
Mexican Light: 1st Bonds	5	5	107½	..	4 13 0
Rio 5% Bonds	5	5	104½	..	4 15 9
Southern Rly.: 5% Prefd.	5	5	75xd	..	6 13 4
5% Pref.	5	5	111xd	..	4 10 0
T. Tilling	10	10	54/–	..	3 14 0
West Riding	10	10	43/6	..	4 12 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Aug. 3	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
			£ s. d.		£ s. d.
Aron Elec. Ord...	7½	10	42/6	..	4 14 0
Assoc. Elec. :					
Ord.	10	10	48/6	..	4 2 2
Pref.	8	8	38/–	..	4 4 3
AutomaticTel.&Tel.	12½	12½	57/–	+6d.	4 7 9
Babcock & Wilcox	11	11	48/3	+1/–	4 11 5
British Aluminium	10	10	48/6	..	4 2 6
British Insul. Ord.	20	20	5 5/16	+¼	3 15 6
British Thermostat (5/–)	18½	18½	18/6	+1/–	5 0 0
British Vac.Cleaner (5/–)	15	30	27/6	+6d.	5 11 1
Brush Ord. (5/–)	6	8	8/–	..	5 0 0
Burco (5/–) ..	15	15	14/3	..	5 5 1
Callender's ..	15	20	97/–	+2/–	4 2 6
ChlorideElec.Storage	15	15	82/6	+⅛	3 13 0
Cole, E. K. (5/–)	7	10	25/–	+1/6	2 0 0
Consolidated Signal	17	24	5 7/16	..	4 8 3
Cossor, A. C. (5/–)	15	10*	24/–	..	1 11 3
Crabtree (10/–) ..	17½	17½	38/–	..	4 12 4
Crompton Parkinson Ord. (5/–) ..	20	20	26/–	..	3 17 0
E.M.I. (10/–) ..	6	6	27/3	+2/–	2 4 0
Elec. Construction	10	12½	47/6	..	5 5 3
Enfield Cable Ord.	12½	12½	58/–	+¼	4 6 1
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric	10	10	48/–	..	4 3 4
Ensign Lamps (5/–)	25	25	21/3	..	5 17 8
Ericsson Tel. (5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)	40	40	38/6	+1/–	5 4 0
Falk Stadelmann	7½	7½	31/6	..	4 15 3
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. : Pref. ..	6½	6½	32/–	..	4 1 3
,, Ord. ..	17½	17½	89/0	+1/6	3 18 8
Greenwood&Batley	15	15	38/6xd	–1/6	7 15 10
HallTelephone(10/–)	12½	12½	25/3	..	4 19 0
Henley's (5/–) ..	20	20	25/9	+6d.	3 17 8
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	17½	63/9	..	5 9 9
India Rubber Pref.	5½	5½	21/–	..	5 4 9
Intl. Combustion	30	30	6½	..	4 17 10
Johnson & Phillips	15	15	69/–	..	4 7 2
Lancashire Dynamo	20	22½	92/9	..	4 17 0
Laurence, Scott (5/–)	15	12½	12/–	..	5 4 2
London Elec. Wire	7½	7½	31/6	..	4 15 3
Mather & Platt ..	10	10	49/–	+3d.	4 1 8
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5½	+1/16	3 16 0
Pye Deferred (5/–)	25	25	25/–	+1/16	5 0 0
Revo (10/–) ..	17½	17½	37/–	..	4 14 7
Reyrolle.. ..	12½	12½	67/6	..	3 14 0
Siemens Ord. ..	7½	7½	32/3	+2/–	4 13 0
Strand Elec. (5/–)	4	7½	7/3	..	5 3 5
Switchgear & Cowans (5/–) ..	10	20	15/6	..	6 9 0
T.C.C. (10/–) ..	5	5	18/9	..	2 13 4
T.C. & M. ..	10	10	52/–	+6d.	3 17 1
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	21/6	..	4 13 1
Tube Investments	20	20	91/–	..	4 8 1
Vactric (5/–) ..	Nil	Nil	14/–	–3d.	—
Vickers (10/–) ..	10	10	19/6	+3d.	5 2 7
WalsallConduits(4/–)	55	55	43/6	..	5 1 2
Ward & Goldstone (5/–)	20	20	23/0	..	4 4 2
WestinghouseBrake	10	12½	62/6	..	4 0 0
West, Allen (5/–)	7½	7½	7/6	..	5 0 0

* 5 per cent. tax-free.

† Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 188)

stood at 61s., British Insulated at 83s. and Henley's at 18s.

Five thousand Telephone & General Trust £1 ordinary shares are on offer in the market at 32s., yielding 5 per cent. at that price. A similar number of Telephone Rentals 5s. shares can be obtained at 11s, this affording £4 11s. per cent. on the money.

Radio Shares

Public interest in the shares of the radio group is unabated. Every business day a large turnover of shares takes place in the popular issues, of which Electrical & Musical Industries stand easily first at the present time. After the rise of 1s. 9d. last week, which took the price to 25s. 3d., a further advance carried it to 27s. 3d. comparing with 19s. 9d. at the beginning of the current year. Pye deferred shares are again 1/16 up at 25s. Cossor shares have been largely dealt in around 24s. and Philco shares changed hands by the thousand at 12s. 6d. Looking to post-war prospects, the present-day buyer contends that television is going to be one of the principal of the newer fields of industry, and in the other radio areas wide scope exists for enterprise.

Miscellaneous Matters

The two Anglo-American Telegraph stocks, preferred and deferred, now stand upon practically the same plane, allowing for the dividend on the preferred being 6 per cent., and that on the deferred 1½ per cent. Both prices are better on the week. Cable & Wireless ordinary has dropped to 77½. Oriental Telephones at 43s. are in favour from tax-savers. Canadian Marconis have lost 6d. at 9s. 6d., dollar stocks being mostly down upon a break that occurred in the New York Stock Exchange. Wall Street speculators have been bearish; they are charged with being apprehensive of an early end of the war in Europe and a consequent curtailment of American war production. Brazilian issues gave way abruptly, Brazilian Tractions falling to 28 but rallying to 30. No change took place in Anglo-Argentine Tramways upon the setting of a time limit for agreement to be reached upon points in the dispute between the Argentine Government and the Traffic Board. Shares in pomestic companies engaged in heavy industry are a good market.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

AUTOMATIC Telephone & Electric Co., Ltd., and J. St. C. W. Graham.—" Gyroscopes." 17677. December 14th, 1940. (554620.)

British Insulated Cables, Ltd., R. Blackburn and H. R. F. Carsten.—" Construction of electric cable for use with currents of high-frequency." 4990. April 15th, 1942. (554747.)

British Insulated Cables, Ltd., G. H. Walton J. C. Quayle and P. Jones.—" Heat treatment of the insulating coverings of electric wires and cables and other materials." 5192. April 18th, 1942. (554749.)

British Thomson-Houston Co., Ltd.—" Electric protective systems employing distance relays." 864/42. January 21st, 1941. (554667.) " Protective apparatus for electric circuits." 754/42. January 21st, 1941. (554701.) " Electron microscopes." 5901/42. May 1st, 1941. (554710.) " Mercury boilers and like elastic fluid generators." 7019/42. May 28th, 1941. (554778.)

British Thomson-Houston Co., Ltd., K. J. R. Cocke and C. W. Wood.—" Electric lighting and/or radiant heating fittings." 552. January 14th, 1942. (554698.)

British Thomson-Houston Co., Ltd., H. Brecknock, F. Widnall and J. C. Lowson.—" Means for supporting radiant heat emitting sources such as infra-red lamps." Cognate applications 16067/41 and 2034/42. December 12th, 1941. (554754.)

Concrete Utilities, Ltd., and C. A. Marques.—" Electric heating of structures." 644. January 16th, 1942. (554700.)

Creed & Co., Ltd., and F. P. Mason.—" Synchronous motors." 14359. November 7th, 1941. (554656.)

Electric Resistance Furnace Co., Ltd., and W. J. Millar.—" Furnaces for heating metals and the like." 495. January 13th, 1942. (554726.)

Electric Resistance Furnace Co., Ltd., and J. A. Monks.—" Heat-treatment of metallic material or articles." 496. January 13th, 1942. (554696.)

Electric Resistance Furnace Co., Ltd., W. J. Millar and J. A. Monks.—" Furnaces for continuous heat-treatment." 494. January 13th, 1942. (554725.)

English Electric Co., Ltd., and G. Davison.—" Means for stripping insulation from insulated electric conductors." 2893. March 5th, 1942. (554637.)

English Electric Co., Ltd., and R. P. E. Tabb.—" Automatic regulation of the current in an electric circuit." Cognate applications 14039/41 and 3210/42. October 31st, 1941. (554622.)

English Electric Co., Ltd., H. S. Carnegie, R. L. English and R. P. E. Tabb.—" Control of dynamo-electric machines coupled to coiling reels and the like." 14040. October 31st, 1941. (554623.) Ditto 14041. (554624.) Ditto 14042. (554625.) Ditto 9963/43. (Divided out of 554623.) (554650.)

General Electric Co., Ltd., E. Kettlewell and J. W. Ryde.—" H.p., m.v. electric-discharge devices." 4677. April 9th, 1942. (Addition to 543161.) (554678.)

H. M. Harmer.—" Regulating arrangements for electrical circuits." 5810/43. October 28th, 1941. (Divided out of 554467.) (554712.)

Hazeltine Corporation. — " Carrier - signal receiver." 1434/42. January 23rd, 1941. (554668.)

Linde Air Products Co.—" Electric welding." 14604/41. October 3rd, 1940. (554687.)

Mullard Radio Valve Co., Ltd., and K. E. Latimer.—" High-frequency resistances." 380. January 9th, 1942. (554630.)

W. H. Norris.—" Electro-magnetic switches for the remote control of electrical mechanisms." 5142. April 17th, 1942. (Addition to 547560.) (554643.) " Telephone systems." 5143. April 17th, 1942. (554772.)

Patelhold Patentverwertungs and Elektro-Holding Akt.-Ges.—" High-current cathodes for transmitting tubes." 15724/41. December 13th, 1940. (554627.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—" Frequency-changing devices, more particularly for very short waves." 3350. March 13th, 1942. (554675.) " Inductance coils." 458. January 12th, 1942. (554724.)

Philips Lamps, Ltd., and W. E. Baker.—" X-ray methods and apparatus." 574. January 14th, 1942. (554699.)

Sangamo Weston, Ltd. (Weston Electrical Instrument Corporation). — " Damping apparatus for electrical measuring instruments." 7224. May 28th, 1942. (554779.)

Standard Telephones & Cables, Ltd.—" Carrier-wave modulating circuit." 6228/42. April 8th, 1941. (554751.) " Rochelle salt piezo-electric crystal apparatus." 9542/42. May 23rd, 1941. (554787.) Ditto. 9959/42. May 9th, 1941. (554788.) Ditto. 9960/42. May 22nd, 1941. (554789.) " Piezo-electric crystal networks for controlling oscillators." 9966/42. July 25th, 1941. (554790.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—" Electrical signal transmission system." 9540. July 9th, 1942. (554786.)

A. V. Tomlinson (Union Switch & Signal Co.).—" Manufacture of alternating electric current rectifiers." 5983. May 4th, 1942. (554645.)

Westinghouse Electric International Co.—" Starting electrodes for electric-discharge devices." 4726/42. April 10th, 1941. (554707.)

H. Whitehouse.—" Electric current timing devices for welding machines or the like." 1464. February 4th, 1942. (554735.)

Amended Specifications

Marconi's Wireless Telegraph Co., Ltd., and others.—" Automatic frequency-control systems."

Briggs Manufacturing Co.—" Electric welding apparatus."

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—NEW SOUTH WALES.—October 27th. Sydney County Council. Steam generating plant, Pyrmont power station (Section B); Specification 650. 50,000-kW steam turbo-alternator; Specification 651.

West Midlands.—August 10th. Joint Electricity Authority. 33-kV interconnecting cable. (July 23rd.)

Newcastle-on-Tyne.—Education Committee. Installation of electric lighting at the new temporary infants' school on Blakelaw estate. Plans by the education architect, Education Offices, Newcastle.

Orders Placed

London.—J.E.A. It was recently recommended that the contract for transformers from the Hackbridge Electric Construction Co., Ltd., should be extended for a further period. The Local Distribution Committee now reports that the company is not prepared to agree to this extension.

SOUTHWARK.—Electricity Committee. Accepted. Cables (£239).—Scottish Cables.

ST. PANCRAS.—Electricity Committee. Cable contracts extended for twelve months.—Metropolitan Electric Cable & Construction Co.; Standard Telephones & Cables.

Manchester.—Electricity Committee. Accepted for twelve months:—Adhesive tape.—L. Andrew & Co. Cable cover tiles and concrete slabs.—H. J. Baldwin & Co.; Cable Covers, Ltd.; Callender's. Conduit and accessories for wiring.—L. Andrew & Co. Insulating cloth.—Hamnett & Andrew. Service boxes.—W. Lucy & Co. Steam and water tubes and fittings.—S. Gratrix. Tapes.—Callender's; Henley's; L. Andrew & Co.; Ryknеld Mills Co. Wires, cotton and silk-covered.—Enfield Cable Works; L.P.S. Electric Co. Wire, tinned copper bare.—E. & E. Kaye.

Middlesbrough.—Education Committee. Accepted. Electric lighting and power installation at the Lawson School and High School canteen kitchens (£81).—Watson & Coates.

Morecambe.—Electricity Committee. Accepted. 100-kVA transformer (£133).—Electric Construction Co.

Salford.—Light, Heat and Power Committee. Accepted. 500-kW mercury arc rectifier (£1,875).—Hewittic Electric Co.

Smethwick.—Estates Committee. Accepted. Amplification equipment at Assembly Hall (£135).—Hadley Bros.

Southgate.—Catering Committee. Accepted. Refrigerator (£95).—Frigidaire.

Tynemouth.—Education Committee. Accepted. Internal telephone system installation at the education offices (£169).—Dictograph Telephones.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bradford.—Messroom, Birkstall gas works (£1,702); city engineer.

Huts, St. Joseph's College; city architect.

Cheshire.—Additions, Capenhurst remand home (£4,250); county architect, Chester.

Driffield.—Workshop; Horth & Andrews, architects, Whitefriargate, Hull.

Greenock.—Rebuilding Caddlehill Laundry after fire; manager.

Kent.—Maternity home (£6,000); additions to Bexley Girls' Technical School (£3,750); School extension and kitchen at Pembury; Additions to Grange Colony, Leybourne (£3,776); Additions to West View Institution, Tenterden (£4,000); Youth centre, Sevenoaks (£2,500) and nurses' accommodation, County Hospital, Pembury (£6,500); county architect, Maidstone.

Lancashire.—Joint drainage and sewage disposal works for Lancashire County Council and Warrington and St. Helens Borough Councils; John Taylor & Sons, chartered civil engineers, Victoria Street, London, S.W.1.

Manchester.—Pre-fabricated day nurseries:—Miles Platting; Intrade, Ltd., builders, Northleach, Gloucestershire (£3,100). Moss Side; Jones & Craig, builders, Pavenoak Road, Cheadle Heath, Stockport (£3,000).

Middlesex.—Institution for 75 mental cases, and steam raising plant at Clare Hall Sanatorium; county surveyor.

Morpeth.—Land workers' hostel for the Northumberland War Agricultural Executive Committee, Alnwick.

North Shields.—Boiler house, for Smith's Dock Co., Ltd.; Stephen Easten Ltd., builders, Westgate Road, Newcastle-on-Tyne.

Nottinghamshire.—Huts for mental patients, Carlton; county architect, Nottingham.

Paisley.—Converting building into canteen, etc. for United Thread Mills, Ltd., at Ferguslie Works; manager.

Southgate.—Nursery, Hoppers Road (£1,949); H. C. Leach.

South Shields.—Offices, Nile Street for Smith & Co., Ltd.; F. W. Newby, architect, King Street, South Shields.

Sunderland.—Canteen for the North Eastern Marine Engineering Co., Ltd.; D. & J. Ranken, Ltd., Stockton Road.

Additions, water-softening house at the electricity works; borough electrical engineer, Dunning Street.

West Hartlepool.—Temporary school accommodation, Seaton estate; borough engineer.

Wood Green.—Works additions; Wenwright Bros.